

MODEL AIRPLANE NEWS

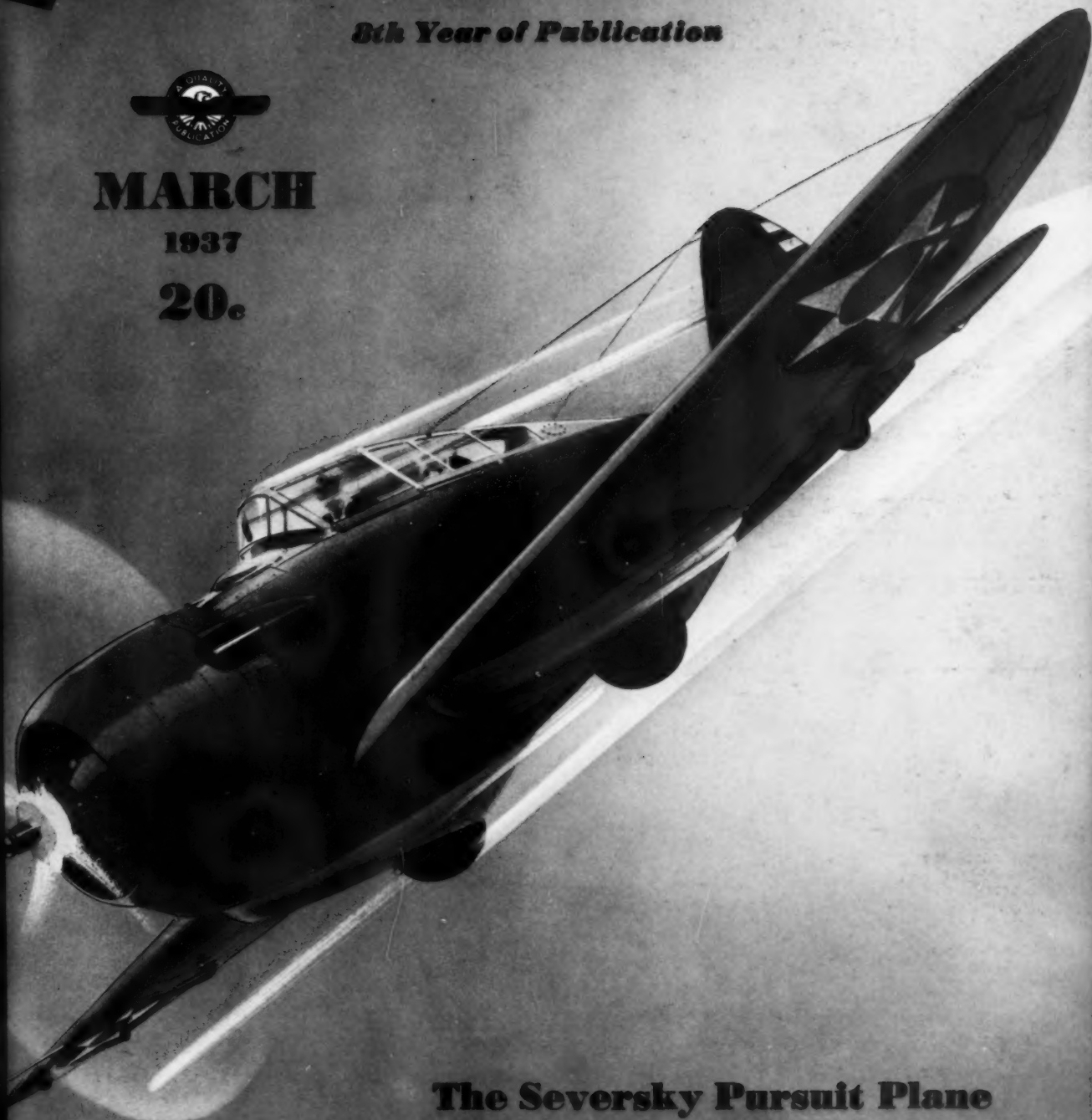
8th Year of Publication



MARCH

1937

20c



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Jo Kotula

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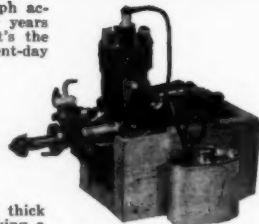
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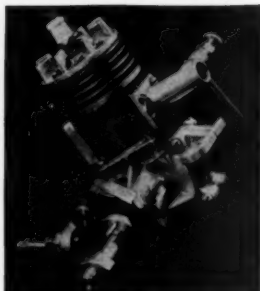
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Richmond Hill, L.I., December 26, 1936.

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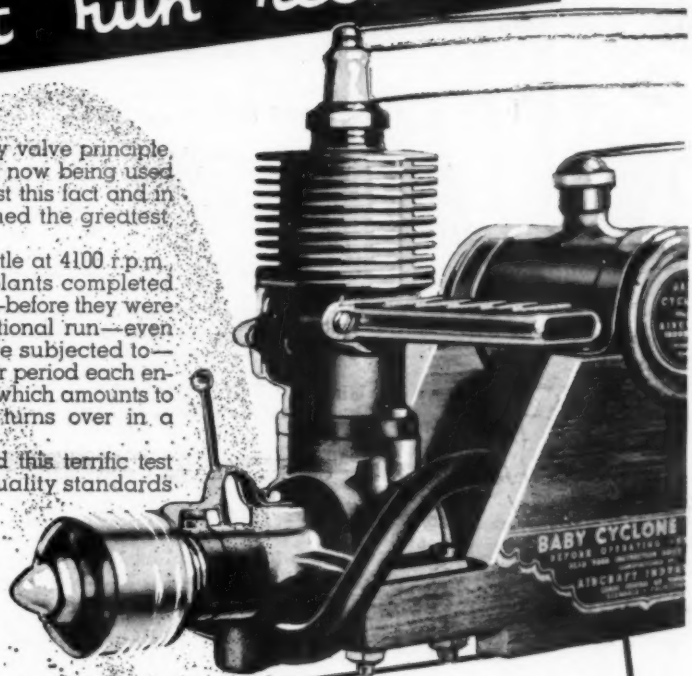
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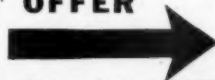
No miniature engine before has ever withstood this terrific test—because no engine is built to the precision-quality standards which have established Baby Cyclone Engines as supreme in their field.

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Model AIRPLANE News

8th YEAR OF PUBLICATION

VOL. XVI

No. 3

Edited by Charles Hampson Grant

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In Our Next Issue

What About Rockets? by Nick Limber, member of the Westchester Rocket Society, tells you the fascinating story of rocket development from its beginning to the present day.

Joseph Battaglia provides plans and complete instructions to build a fine flying model of a famous transcontinental mail carrier in **A Flying Consolidated Fleetster Model**.

Leo Weiss concludes the description of how to build an efficient contest gas job in **A Streamline Gas Model (Part No. 3)**

Designing Your Model for Distance by Charles Hampson Grant, shows you how long flights under power may be obtained by giving your models the correct proportions. Mr. Grant also presents accurate plans for a carefully designed Contest Speed Model.

Build This Stinson From Scrap Wood, by Jesse Davidson shows how you can make a scale model glider that will fly.

A World Record Glider, by Tex Richard, gives you plans and instructions to construct an all balsa contest glider that broke the world's record.

Other interesting and instructive articles and drawings will appear, also such as **Frontiers of Aviation**, **Gas Lines**, **Air Ways**, **A Timer for Gas Models**, **A Gas Model Wiring System for Starting Batteries**, and a three view drawing of the **Gloster Gauntlet**.

Published Monthly by JAY PUBLISHING CORP., Mount Morris, Illinois.

Editorial and General Offices, 551 Fifth Avenue, New York City.
George C. Johnson, President.
Jay P. Cleveland, Advertising Manager, 551 Fifth Avenue, New York, N. Y.
Entered as second-class matter Dec. 6, 1934, at the post office at Mount Morris, Ill., under the act of March 3, 1879. Additional entry at New York, N. Y.

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Price 20c a copy. Subscription price \$1.65 a year in the United States and its possessions; also Cuba, Mexico and Panama.

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SPONGE RUBBER TAIL WHEEL 1 1/4 in.	.10

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The Evolution of Carrier Aviation

How Naval Aviation Has Become a Powerful Fighting Force Since Eugene Ely Made the First Flight From the Deck of a Ship

By GORDON SEAR WILLIAMS

AIRCRAFT carriers have become one of the most important links in the chain of defence of this nation, as well as that of others. By virtue of the large number of aircraft which can be accommodated aboard these floating airports, they now rate high in any comparison of naval strength. The United States Navy has done much work in perfecting these carriers, as well as arresting gear, catapults, and other components used aboard our latest vessels. Recent cruises of the fleet in which the carriers Saratoga, Lexington and Langley took part, bring to light the fact that the combined airplanes of these ships flew the amazing distance of 1,341,500 miles, or about 54 times around the world at the equator.

It was twenty-six years ago that the Navy Department became interested in the feasibility of carrier aviation and asked the Wright Brothers to try such a flight from the forward deck of a battleship. This, however, they declined to do, and it fell to the Curtiss Company and Mr. Eugene Ely to make the initial attempt. This historic flight was made from the old U.S.S. Birmingham at Hampton Roads, Virginia, on November 14th, 1910. Still later Mr. Ely made a landing and take-off from aboard ship, this time using the U.S.S. Pennsylvania anchored in San Francisco harbor. These successful operations greatly impressed the high command with the

possibilities of naval aviation and since that date constant experiments have been carried on to make this specialized branch of aviation safer, more reliable and of greater use to the navy.

The first practical experiment in carrier aviation in this country was made when the collier, U.S.S. Jupiter, was rebuilt and rechristened the U.S.S. Langley in 1922. It was relatively small as carriers go, being a vessel of 11,500 tons displacement; having a length of 542 feet and a beam of but 65 feet. Its top speed was 15 knots.

As our naval pilots had had no training

in the difficult feat of landing on a narrow ship deck, a "deck" was built on land at the aviation field at Hampton

Roads and much training was done there.

Through the data gained in constructing and testing the Langley, two other carriers were built, the Saratoga and the Lexington, both of which were redesigned battle cruisers. They went into commission late in 1927 and joined the fleet in maneuvers for the first time in 1928. Both are exactly alike in major design, being 888 feet long and 105 feet in beam. They attain a top speed of 33.5 knots per hour and are driven by motors of approximately 180,000 horsepower. As both ships are exactly alike some means had to be used to keep pilots from landing on the wrong carrier. The Lexington has a wide

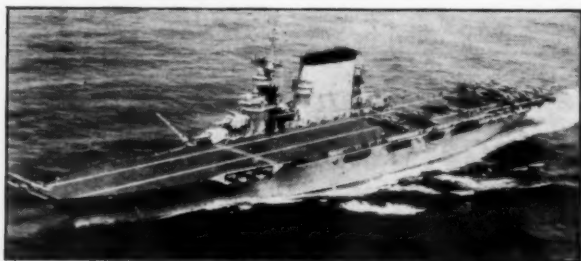
black stripe horizontally around the funnel while the Saratoga has its marking stripe in vertical position. Displacement is 33,000 tons and each ship is a self-contained, completely equipped floating airport.

The newest carrier in service with the fleet is the Ranger, a vessel of 14,500 tons and the first United States carrier to be designed and completed as such. Length overall of this ship is but 769 feet and beam is 80 feet. Speeds are also somewhat slower, maximum being slightly over 29 knots.

Two new carriers are now being completed and are expected to join the fleet



The launching of the latest U.S. carrier, the Enterprise of 19,900 tons. (Off. Photo U.S. Navy)



The U.S.S. Lexington ploughs along as a Martin T4M-1 takes the air at its bow. (Off. Photo U.S. Navy)



Here is the first experimental carrier, "Langley," rebuilt from a collier. (Off. Photo U.S. Navy)



Navy Curtiss Scout Bomber XSBC-3. (Off. Photo U.S. Navy)

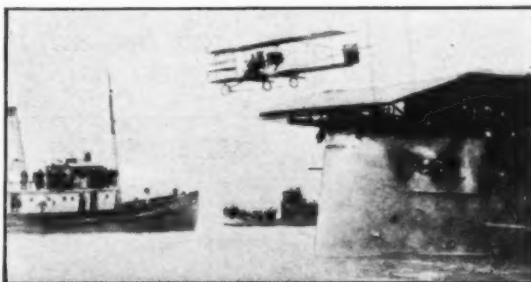


The latest carrier fighter, of 1000 hp., the single-seater Grumman XF3F-2. (Off. Photo U.S. Navy)

shortly. These craft have a length of 761 feet and a beam of 83 feet. They have been christened "U.S.S. Yorktown" and "U.S.S. Enterprise" and are of 19,900 tons displacement.

Carriers and carrier airplanes are also in use in all of the world's larger countries. The British have done much experimental work in deck flying and have many excellent types in use today. Although their first work in deck flying experiments began in 1912, it was not until 1917 that much serious development took place. In that year the old Cunard liner "Compania" was fitted with a deck nearly 250 feet long. Although only catapult operations were attempted, mainly with seaplanes, later on land types successfully took off and landed on her decks. Landings were somewhat hazardous and not always successful. After the ship was steaming into the wind at full speed, the small single-seater landplane (a Sopwith "Camel" was used in many cases) would fly over the ship, around the bridge, cut the engine and glide onto the decking built over the bows of the ship. There a landing party would rush out and grab the plane, sometimes while still in the air, and bring it to rest. In the first test flight on England's carrier "H.M.S. Furious" the plane was easily grabbed by the deck crew and stopped in a few feet, but the second attempt ended fatally. On this landing the deck crew was told to let the plane land itself with no outside help. The landing itself would have been a good one had not a tire burst and swerved the light plane to one side, over the rail, and into the water. The unfortunate pilot was drowned before help could reach him. This accident proved to the British that some sort of retarding

device was necessary. Later, a special arresting gear was strung across the sloping after deck. The arresting gear itself consisted of a number of fore and aft wires a few inches apart, and supported about 5 inches above the deck by wooden blocks.



Eugene Ely makes the first take-off from a ship at sea. (Off. Photo U.S. Navy)



Ely and his plane immediately after landing on the Pennsylvania. (Off. Photo U.S. Navy)

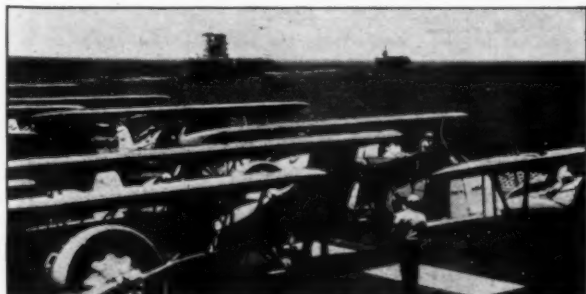
Stretched across these wires were heavy ropes with sandbags attached to either end. Hooks or "horns" in the airplane's landing gear served to keep the plane running straight while it picked up and dragged the transverse wires with bags of sand on their ends. In this way the plane was finally

brought to a complete stop. After each landing, the whole apparatus had to be re-rigged however and prepared for the next landing. Nets were placed alongside and under the bows to prevent any plane from overshooting and diving overboard. Much was learned of air disturbances and their effect on landing and it was decided that a clear deck the whole length of the ship was an absolute necessity. Thus the carrier as we know it today was born.

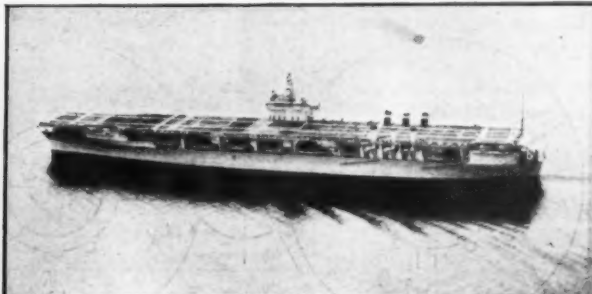
Today, in most cases, the English navy has done away with wire arresting gear and depends upon the braking power of the plane itself to effect a complete stop on deck. Highly trained deck crews are also used to advantage.

Prerequisites of a good carrier plane are many. Due to the stalled attitude in which they are usually landed, a nose that slopes down is desired. Forward vision is vastly important in all carrier types. Good control must be present even at speeds up to the stall, for obvious reasons. An extremely rugged and preferably wide track landing gear is another requirement. Strong independently operated brakes should be fitted. Wings of larger ships should be designed to fold quickly and safely so that they will take up a minimum of space in the hangar deck. All planes must be equipped with some sort of flotation gear in case of forced descent into the water. Further requirements such as durability, dependability and others present in all types of military airplanes are absolute essentials.

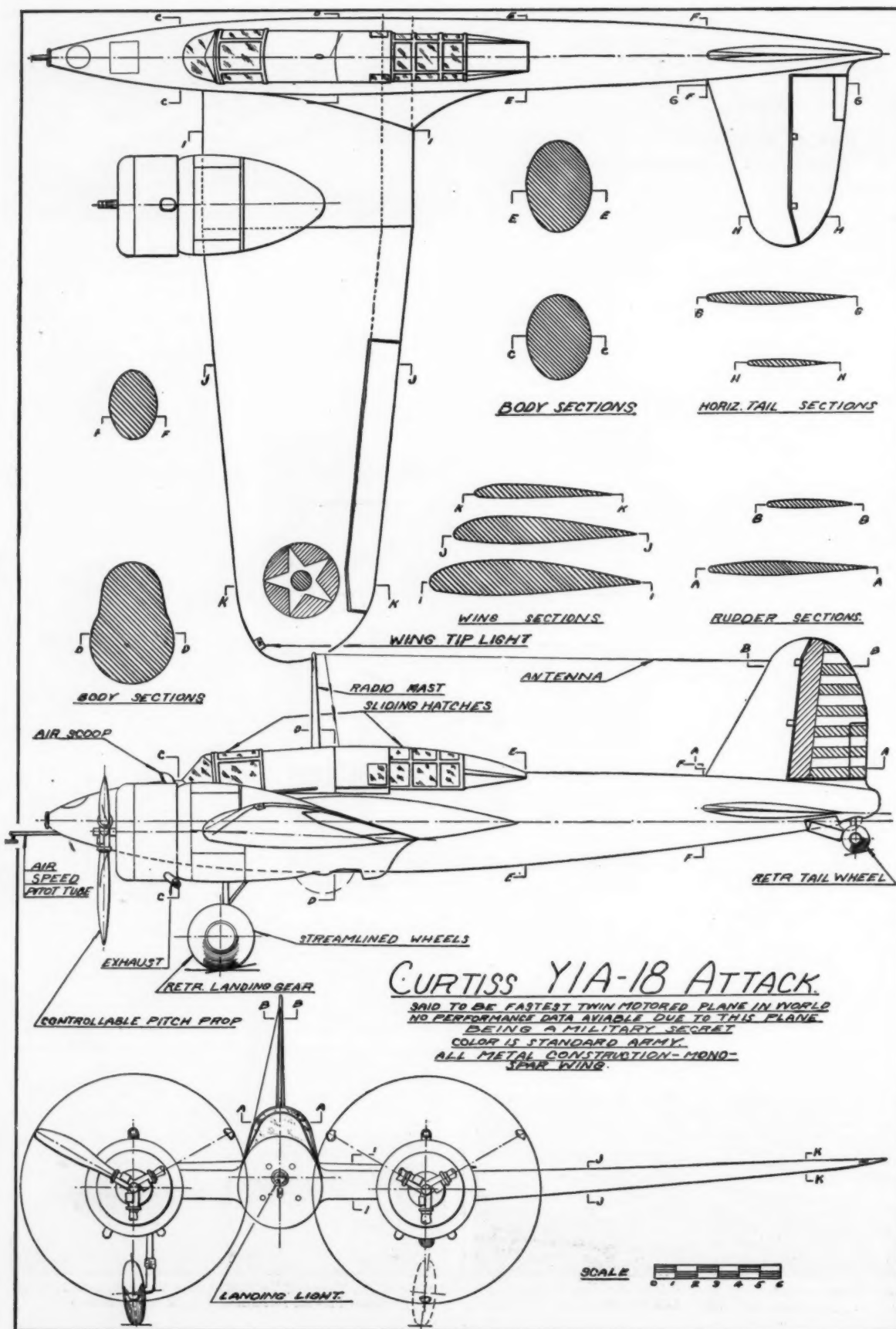
Despite the handicaps under which aircraft are operated aboard carriers only two lives have been lost in aircraft accidents in the U.S. since our first carrier
(Continued on page 34)

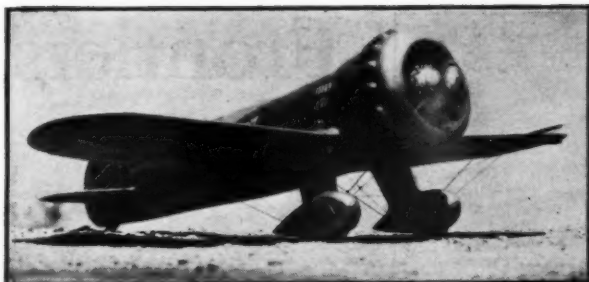


A view of the Lexington and Ranger from the deck of the Saratoga. (Off. Photo U.S. Navy)



A view of the Ranger under headway in Puget Sound. Note the pivoted smoke funnels. (G. S. Williams Photo)





Just a model photograph. Note the spinning "prop"



Photo of a model Hawker Fury by the author

How to Photograph Your Models

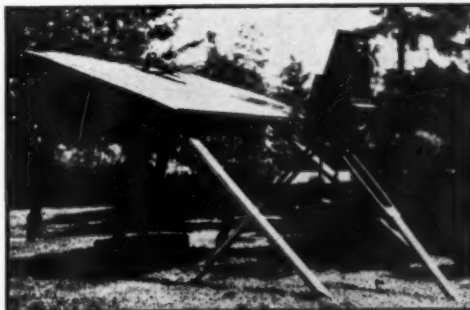
EVERY model builder likes to have a record of the models he has built and certainly no better way can be found than to take several photographs of each model. To make the surroundings life-like and to make the model look like the real airplane it represents is somewhat of a task however, unless the model builder has had considerable experience in photography. Many otherwise good airplane model pictures are spoiled by poor backgrounds that "clutter-up" the photograph and make the model itself appear indistinct. Many various backgrounds are possible, but to show the model to the most advantage and yet give it a realistic appearance, it is usually advisable to have a background as clear as possible. It is often impossible to get such a background showing nothing but clear ground and sky in most of our cities so the following method is offered to enable you to make better, more life-like photos of your models.

In the first place we are trying to simulate actual airport surroundings insofar as we must have a portion of the ground and sky in the picture, yet must not show irrelevant houses, light poles, etc., that clutter up most every available picture-taking locality. One excellent method to overcome this is to tilt the "ground" on which your model is resting so that it is on an angle of say 20 degrees. A table or large packing box, or merely a few boards nailed together, will admirably serve the purpose. Fine, dry dirt or sand should be lightly sprinkled over this "ground piece" and smoothed down evenly so that no large bumps or ridges show. Care should be taken that no hand prints show, as this would obviously spoil the effect you are aiming at. The model should be placed nosed into the sun as much as possible to spread the light most evenly and at the same time to avoid large shadows.

Most solid scale models will stay on the board of their own accord and will not slide downhill but it is usually necessary to fasten down flying models. Pins, with the heads cut off, and pushed into the wheels and

Helpful Hints for the Model Plane Builder That Will Enable Him to Make Fascinating Records of His Creations

By GORDON SEAR WILLIAMS



How the pictures are taken. Tilting the table gives a "sky background"

tail skid and then forced into the ground board will hold the largest models with ease. Small wheel chocks, as used on every airport, can be carved from balsa and used also.

For a true exhibition model, it is usually best to leave the propeller in a stationary position but many model photographs are much improved if the prop is turning over, as though the engine were actually running. Simply blowing on a prop will furnish enough power to turn it at a good speed. Flying models are rather hard to photograph with the prop turning over as due to their lightness the vibration is excessive and will sometimes spoil the picture. It is usually a good idea to place the control surfaces in neutral if the propeller isn't turning, but if the prop is "revving-up" it adds realism to the picture to pull the elevators up as a real

ship does when warming up. Little details like these make the photo more natural looking.

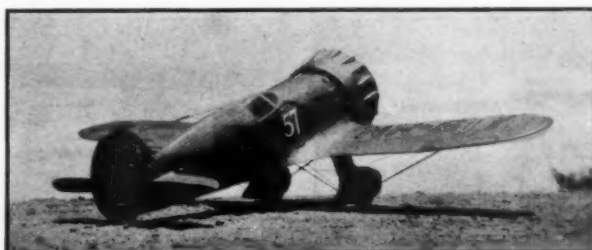
It has also been found advisable to use a light machine oil or fine polish on models before photographing, as this will add just enough sheen to simulate a natural fabric or metal finish. Care should be taken that the camera is on what would be the natural eye level of the real big ship, usually about on a level with the lower wing of a biplane, or slightly above the horizontal tail on most ships.

The best camera for this sort of work is one which has a ground glass back so that direct view focussing is available. However, as many model builders will not have this type of machine, a folding camera will in many cases have to suffice. Box cameras are not recommended but can and have been

used with some success. A portrait attachment can be purchased for most of the better box and folding cameras that will make model photography quite a simple matter. These are merely supplementary lenses that fit over the regular lens so that objects close to the camera will be in focus. Although made for portraits, they serve well for any close up model photography work. They range in price from 75 cents to \$1.50 and are worthwhile additions to your camera equipment. The exposure is the same with this portrait lens as without. With this attachment most cameras can be focussed up to around two feet. A pancromatic type film will be found best because of its correct rendering of colors. With Eastman "Panatomic" film, as was used to take the photos that illustrate this article, an exposure of one second at stop F 32., in bright sunlight, was given. This same exposure can be used for Verichrome or similar type films but should be slightly reduced for the Super-Sensitive types.

Light conditions of course are somewhat different in various localities so these figures may not be exactly correct for some sections. They will, however, serve as a guide to go by. Try the time

(Continued on page 32)



Note the absence of objects in the background



The North American all-metal observation plane. Top speed, 232 m.p.h. (Morrison)

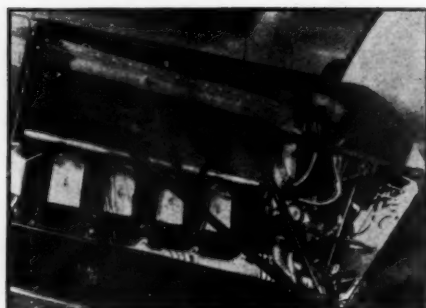
Frontiers OF Aviation

By ROBERT C. MORRISON

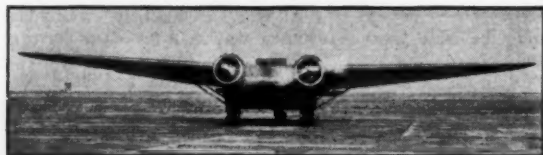
Planes Here and Abroad—How You Can Build a Scale North American Observation Plane

ANOTHER month has passed full of army and navy contracts. Again it was the Consolidated Aircraft Corp. who was the largest recipient. 66 of their VPB type air boats were ordered by the navy at a total price of \$6,056,500! Chance

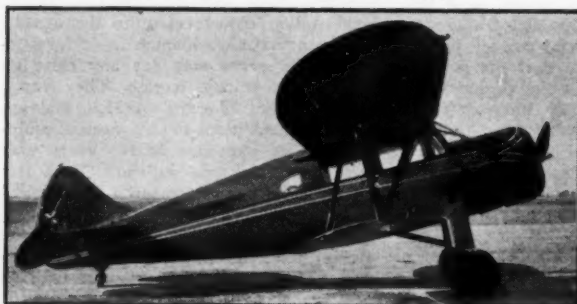
Vought will get \$854,877 for 40 bombers just ordered by the navy while North American, now supplying the army with most of its basic training planes, recently nosed out the Douglas concern to get a \$3,429,600 contract for 120 army observation planes. Immediately their stock jumped from 9 to higher than 13. The planes ordered have been described briefly in past issues of this paper. They will carry a crew of three, pilot, gunner and observer. The pilot and gunner will sit tandem in an enclosure above the wing and the observer will occupy a compartment in the fuselage underneath the wing where he can operate cameras, a radio and gun. All three landing gear wheels are retractable. A speed of 232 m.p.h. is expected of the ships. The engine is an 850 hp. Wright Cyclone.



200 hp. Menasco of Lindbergh's "Miles"



The Burnelli Transport that has been revamped for trans-Atlantic flying. (Two 680 hp. Hornets)



The Waco UQC-6 powered with a 250 hp. continental fuel injection motor with no carburetor. (Only one built)

The horizontal tail surfaces of the North American trainers have been changed. There are now no balances on the elevators.

On October 26th, Lockheed bid \$43,286 for one airplane or \$35,298 for each of five. This price was without engines, and were for twin-engined army transports. Delivery of three was begun last month. The Lockheed Company has been showing increasing interest in military orders and has recently hired a great number of engineers to forge ahead more rapidly on the design of new ships.

Recently one of their Model 12s was completed for the Department of Commerce equipped with the latest in radio homing devices and Sperry gyropilots.

It may be possible that Bell Aircraft and Fairchild are working on new army ships.

Those new Consolidated PB-2A two-place pursuits, all of which have been delivered to the army, have shown a surprising burst of speed for their particular design. In the speed dashes on a straight-away course in conjunction with the Mitchell Trophy Race, a PB-2A piloted by Lieut. McKesson obtained a speed of 251.74 m.p.h. to beat a couple of Boeing P-26 competitors. The nearest Boeing to him did 242.34 m.p.h.

In the Mitchell Trophy Race only PB-2As competed and staged a very close and exciting race. The race was begun by one plane at a time diving out of a Lufberry Circle into the race course. The first one to finish the five laps around a 20 mile course was Lieut. John M. Sterling with a speed of 217.546 m.p.h. to break the existing record made in 1934. Rules of the race were to not exceed a certain number of r.p.m.

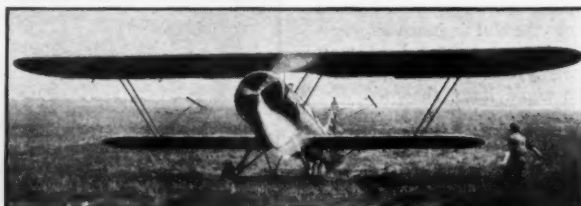
The winning time of the Boeing Trophy Race, held on the same day, was 203.37 m.p.h.

The races were held in memory of the late General "Billy" Mitchell's brother who was killed in the World War. Michigan was the scene of the annual event.

It seems, in spite of all the controversy, that the New York-Paris life-risking race will be staged as scheduled in May. The recent Paris-Saigon and return race was even more of a flop than the Johannesburg one-plane-finish race that the French are determined to make the New York-Paris event very successful, and at present it appears that the French will win it unless something is done in this country to develop a new long-range twin-engined racer. We all know what the



Curtiss Fighters recently presented to Chiang-Kai-Shek on his birthday for China's defence. (Univ. Newsreel from Globe)



The Potez 50 with a Gnome-Rhone K-14 motor that set an altitude record a few months ago. (International)



Here is the latest Howard commercial, the D.G.A.-8. The tail design is different from the old "Mr. Mulligan"



The new Beech C-17B built for Argentina. It is powered with a Jacob's 285hp. engine. Note the compact cowl

Caudron people can do when it comes to building a racing airplane as was illustrated at this year's National Air Races. Though the Coudron twin-engined Goélands performed in a disappointing manner in the Paris-Saigon and (never to) return race they may be slightly revamped for the Atlantic crossing and perform exceedingly well. They are much like the DeHavilland Comets in nearly all respects and are powered by Renault engines of 220 hp. each. The Goélands, two of which were in the race, have a top speed of about 200 m.p.h. and cruise at about 160. Cruising range is almost 2,000 miles. The only other airplane in the race was a Breguet Fulgur which has a top speed of 235 m.p.h. It is a twin-engined plane powered by Gnome-Rhone 900 hp. engines. Cruising range is 1,750 miles.

All three suffered minor crashes and never did finish the race. They, therefore, will not be very serious threats for the speed dash across the Atlantic, but France has learned much from their experiences with these planes, and a new Caudron may soon be built especially for the race. Their twin-engined Typhon should be well suited for the dash. More news on it next month.

While we are on the subject of trans-Atlantic crossings by plane, Col. Lindbergh has been in Dublin looking over a proposed stopping place for the trans-Atlantic airliners of Pan-American Airways. With him has been P.A.A.'s president, Juan Trippe, who was in the interesting process of circling the globe by air.

Now it appears that complications may set up as Col. Lindbergh is still actively engaged in business with T.W.A. even though he is living in London, and T.W.A. it is reported, unofficially however, may compete against Pan-American Airways of which Col. Lindbergh is also employed. Last month T.W.A. sent a representative to Europe to look over the prospects of an airline across the Atlantic it has been reported.

Very frequently there are rumors that Curtiss' giant transport is still to be completed and T.W.A. may be the purchaser. The plane was designed for the stratosphere. (We suggest they name it "The Bends.") Last year when Pan-American began their Pacific operations, there was much talk of T.W.A. going into the ocean-crossing business and of their belief that swift landplanes would be better suited for the job. The new Curtiss giant would be well suited for the task!

Col. Lindbergh's new Miles Mohawk is certainly a fine performing ship. With four fuel tanks in the wing the ship has a cruising range of about 2,000 miles. It is a two-place low-wing airplane of the usual Miles design. The pilot and passenger sit in an enclosure atop the fuselage. The present power plant is an American Menasco B6S 200 hp. engine, but it is likely that a new 1937 Menasco B6S raised to 220 hp. may be installed. This new engine will have a No. 20 spline shaft for a controllable pitch prop which will further improve the performance of the plane. The new engine will also incorporate a new crankcase cover and auxiliary drive housing. A heavier crank shaft with slightly larger bearings will insure smoother running. The engine will be stressed for the full 220 hp. at take-off.

We may see a

Menasco-powered low-wing Aeronca soon.

The new twin-engined Beechcraft should be completed and undergoing tests by the time this is read. Ryan may

(Continued on page 40)



Lindbergh flying in his new Menasco-powered Miles "Mohawk." It has an electric starter



The new Westbrook Sportster of low-wing design. Little is known about this ship



A new French extra light plane with which M. Massotte set a 100-k record. (Globe Photo)

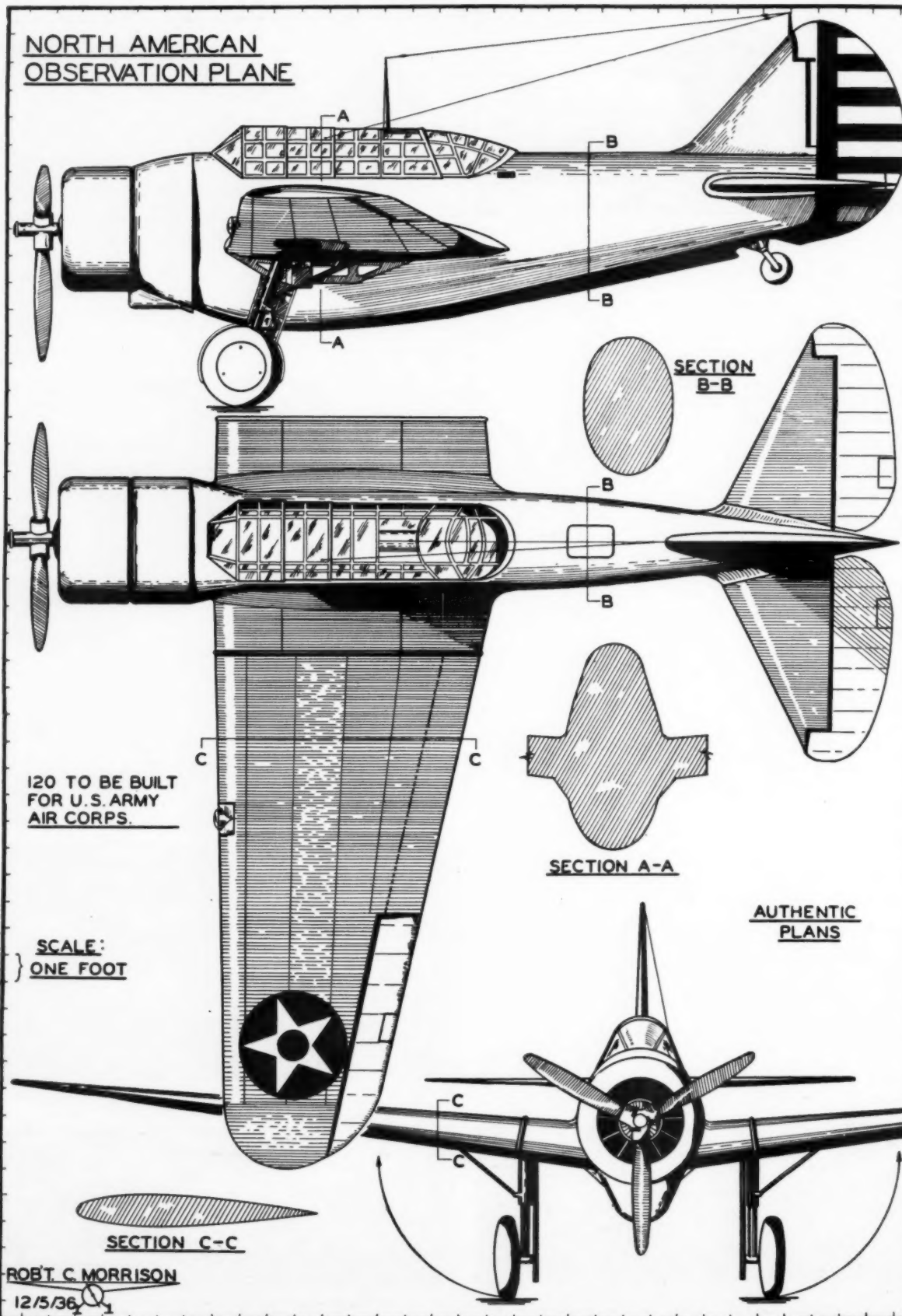


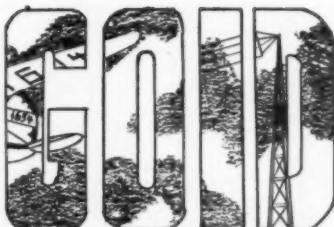
The Breese low-wing racer that misfortune has kept out of the Bendix Races on the last few occasions



One of the latest Northrop Attack planes equipped with flaps with holes in them

NORTH AMERICAN OBSERVATION PLANE





The Big Contest for Future Navigators

Try This and Learn to
Navigate Your Plane

Contest Number Four

By EDWARD L. SEMLER



Domenick Serrano, first place winner of
Navi-Goid Contest No. 2

HERE is the news that many of our young navigators have been looking for; the names of the winners of Navi-Goid Contest No. 2. The following five young men have been selected as winners of this contest:

Domenick Serrano, 46 Van Cleef Street, Jersey City, New Jersey.

John C. Fiebig, 18464 Martin Avenue, Homewood, Illinois.

E. Master, 149 St. Joseph Blvd. W., Montreal, Canada.

Douglas Canning, 909 Main Street, Wayne, Nebraska.

Stirling Post, 696 Stuyvesant Avenue, Irvington, New Jersey.

Of the above winners, Domenick Serrano's entry was superior to all others. The prize these young men win is any kit advertised in MODEL AIRPLANE NEWS valued at \$5 or less.

They all have our heartiest congratulations and MODEL AIRPLANE NEWS trusts that this is only the beginning of many successes in aviation.

Herewith is another Navi-Goid Contest, No. 4. Those who entered the previous contests but did not win have another chance to show their skill. The experience gained from the other Navi-Goids should be of great help to them in carrying through this contest successfully.

The correct procedure to be followed during this contest series was fully explained in three articles printed in the February, March and April issues of MODEL AIRPLANE NEWS. It will be necessary for the contestant to have these articles for guidance.

The instruments you will need:

A sharp pencil.

An accurate pair of dividers.

A protractor. (The protractor will give the degrees of the compass).

Be sure to read thoroughly every detail given in the problem.

Each Navi-Goid will be judged as an individual contest. The prizes, consisting of the choice of any \$5 (or less) model plane kit advertised in MODEL AIRPLANE NEWS, going to the five correct or most nearly correct answers received; in case of tie, duplicate prizes will be awarded.

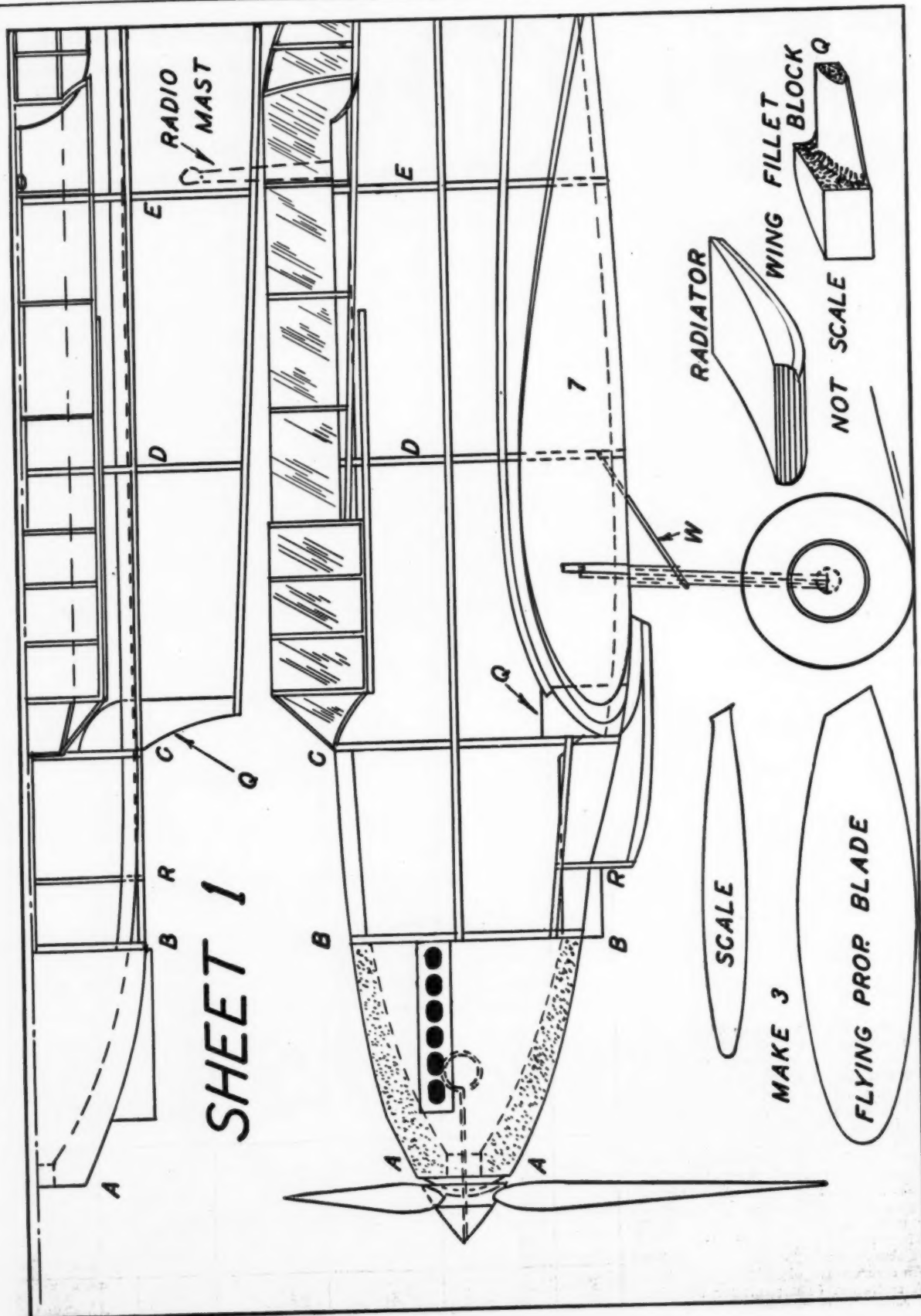


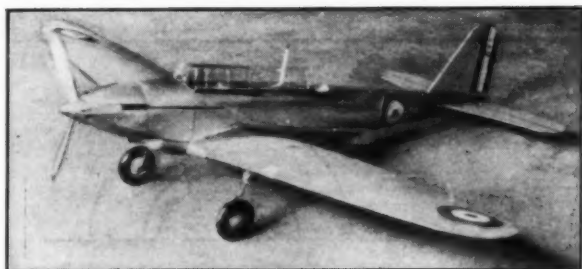
THE pale moon lingered on the flat horizon for long moments as it paused for a last glimpse of the Pacific. Then it dropped, deserting the vast seas to the dark void of midnight. High above, clustered in the lofty vault of the sky, stars winked in peaceful silence.

Lieutenant James Jordan studied the sky thoughtfully. "Gosh," he murmured to his companion, "we'll certainly get enough blind flying to-night."

(Continued on page 38)

NAVI-GOID - No.4. -				EQUATOR	
					0°
					1°
					2°
					3°
					4°
					5°
					6°
124°	123°	122°	121°	120°	





The finished model is just like the big ship



Note the realistic lines and landing gear details

A Miniature Fairey "Battle"

How You Can Build and Fly a Carefully Detailed Model of England's Latest Bomber Fighter That Soon May See Action

By ROBERT V. SMITH

POWERED with the new Rolls Royce "Merlin" engine which develops 1,000 horse power, this raider courses through the skies at better than 260 m.p.h. The "Battle" is an all-purpose job complete with radio, light bombing equipment and guns. With the advent of super bombers and pursuits it was found necessary to develop a plane to keep up with them, so here it is—modeled perfectly in a stable flyer.

Fuselage

Begin the body of the model by cutting out the bulkheads from 1/16" sheet balsa; laminate bulkheads DD and EE so that they will be strong enough to take the wing as they form the wing stubs. The main longerons are 1/16" x 1/8" hard stock. Carve from two soft blocks a right and left wing fillet block Q. The blocks measure 3/8 x 3/8 x 1 1/4" and should be notched to receive the 1/16" square balsa stringers for filleting the wing. Make a radiator block from a 3/4 x 1 7/8" square soft block and shape it as shown; the bottom of it is rounded to the shape of former RR. The small block between formers BB and RR is the oil radiator. From two blocks 3/8 x 1 3/4 x 1 7/8" glued together, carve the nose block, then break open and hollow out as shown; the two blocks are now cemented back together and the whole sanded with ten nought paper.

When all the fuselage framework is assembled, it is covered with 1/64" soft



The author gets some action

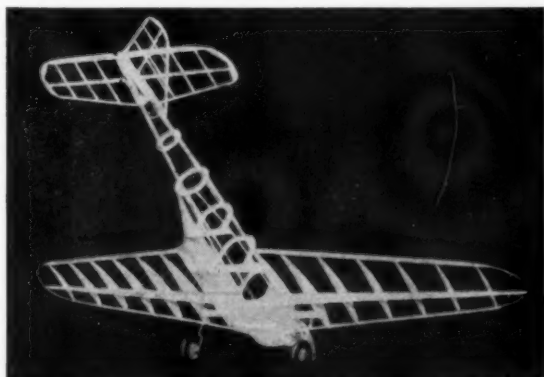


The model in full flight

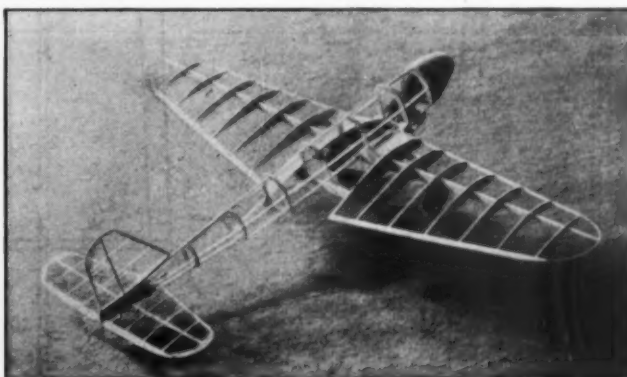
sheet balsa. This is not as hard as it would seem at first but it does take longer than the conventional paper covering job. The wing stub ribs (No. 7) are 1/16" stock and cemented firmly to block Q and formers DD and EE.

Start the covering job by working small sheets around this stub rib and into the fairing stringer back to former GG; when these sheets are dry trim them and cut the gradual curve shown between the trailing edge of the stub rib and former GG. The upper part of the body between formers CC and FF can be covered in one piece and the two cockpits cut out later. Two pieces of sheet will be sufficient to cover the stations between FF and II. The very last section can be covered with two sheets, one on top and one on the bottom. The cross section J is elliptical in section and after this is covered round the back part to the shape in Sheet 2. The small fillet in section CC and DD can be easily put in by the use of a mixture of balsa dust and cement. The whole fuselage should now be doped with a wood filler solution and sanded with ten nought paper when dry. Two coats of silver paint will do for the coloring. The pilot's enclosure is made up from two 1/16" square balsa sticks on to which are cemented eight frames (see sheet 4). These can be made either from bamboo or soft wire. After this "coop" is dry it can be covered with

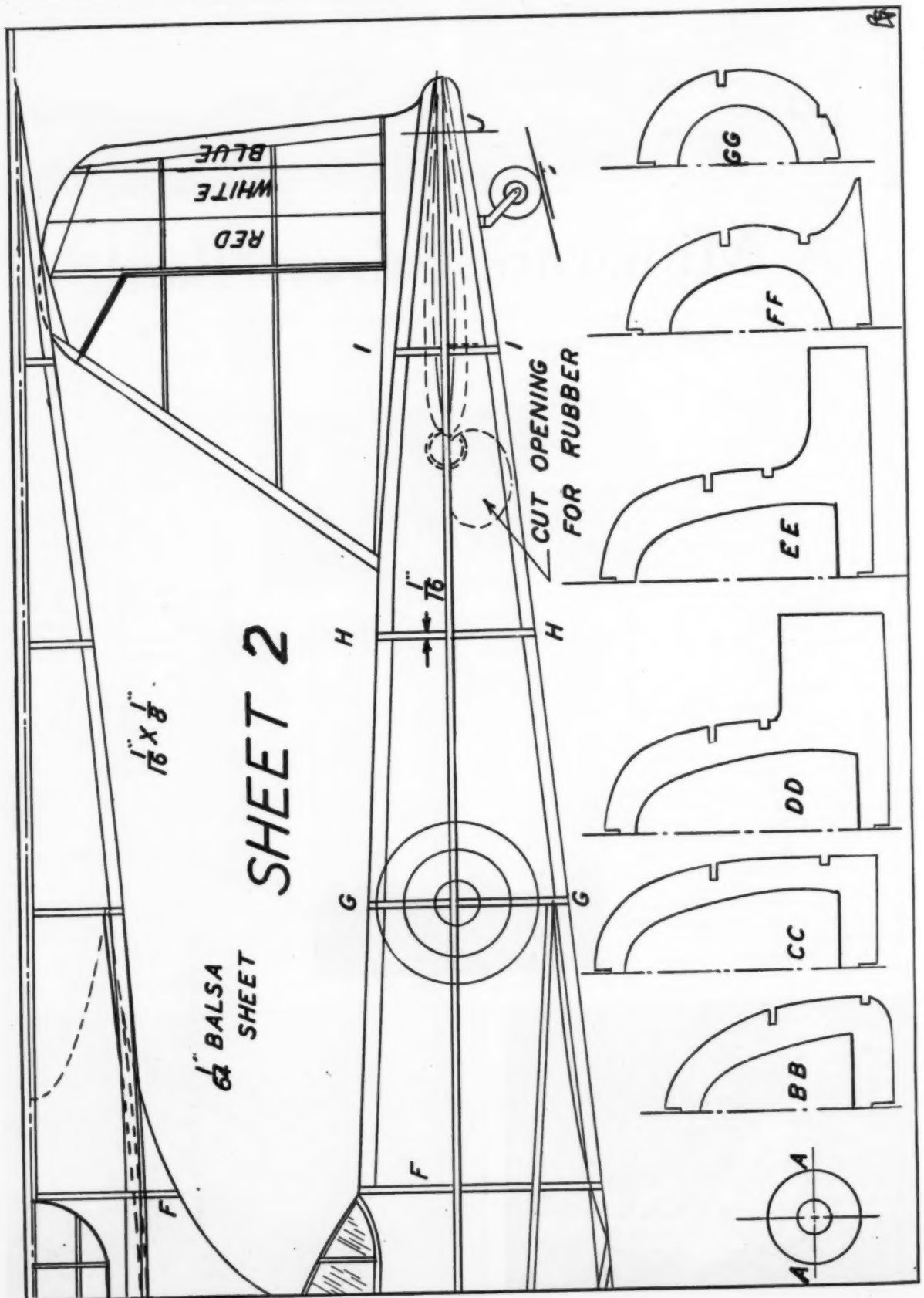
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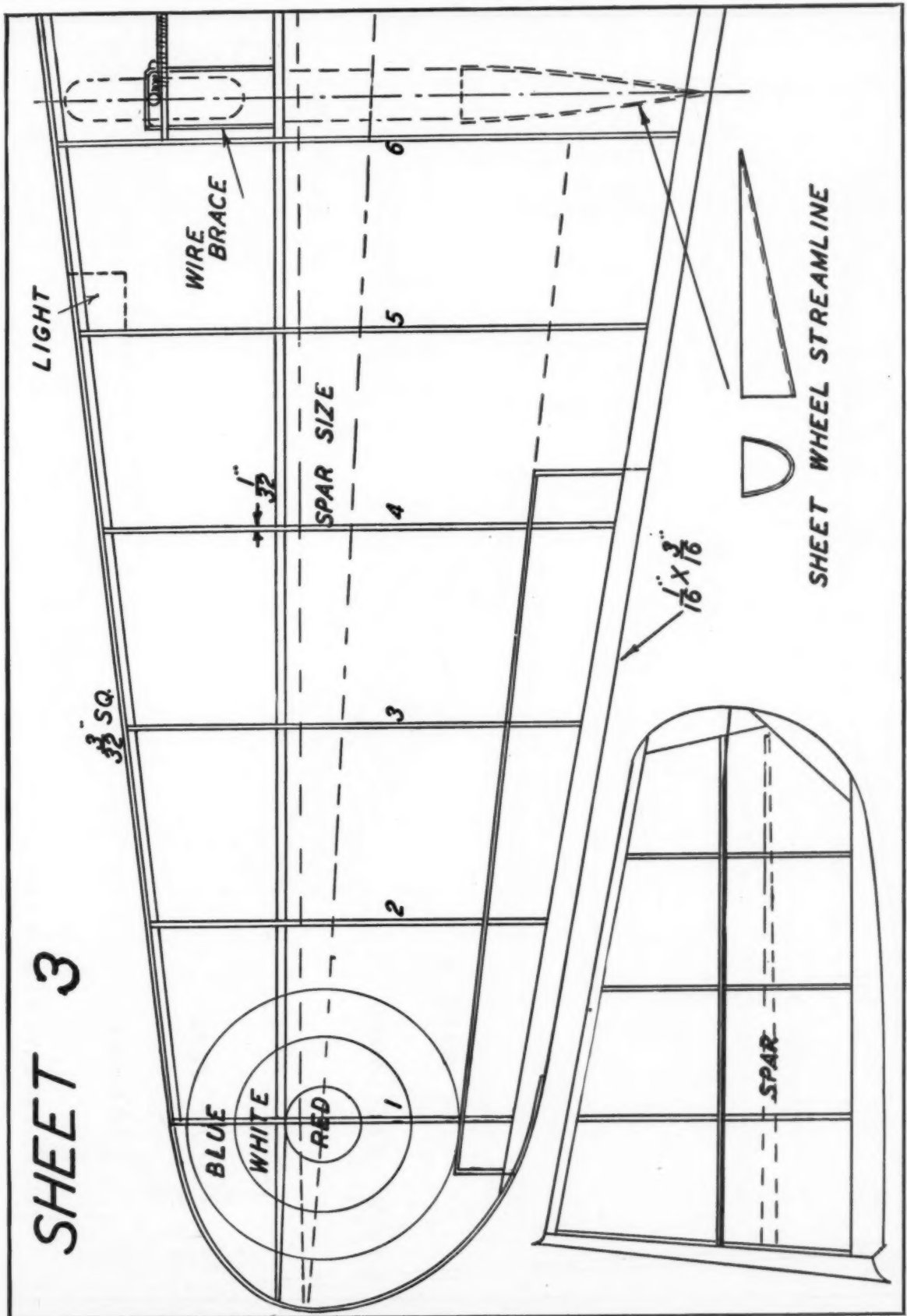


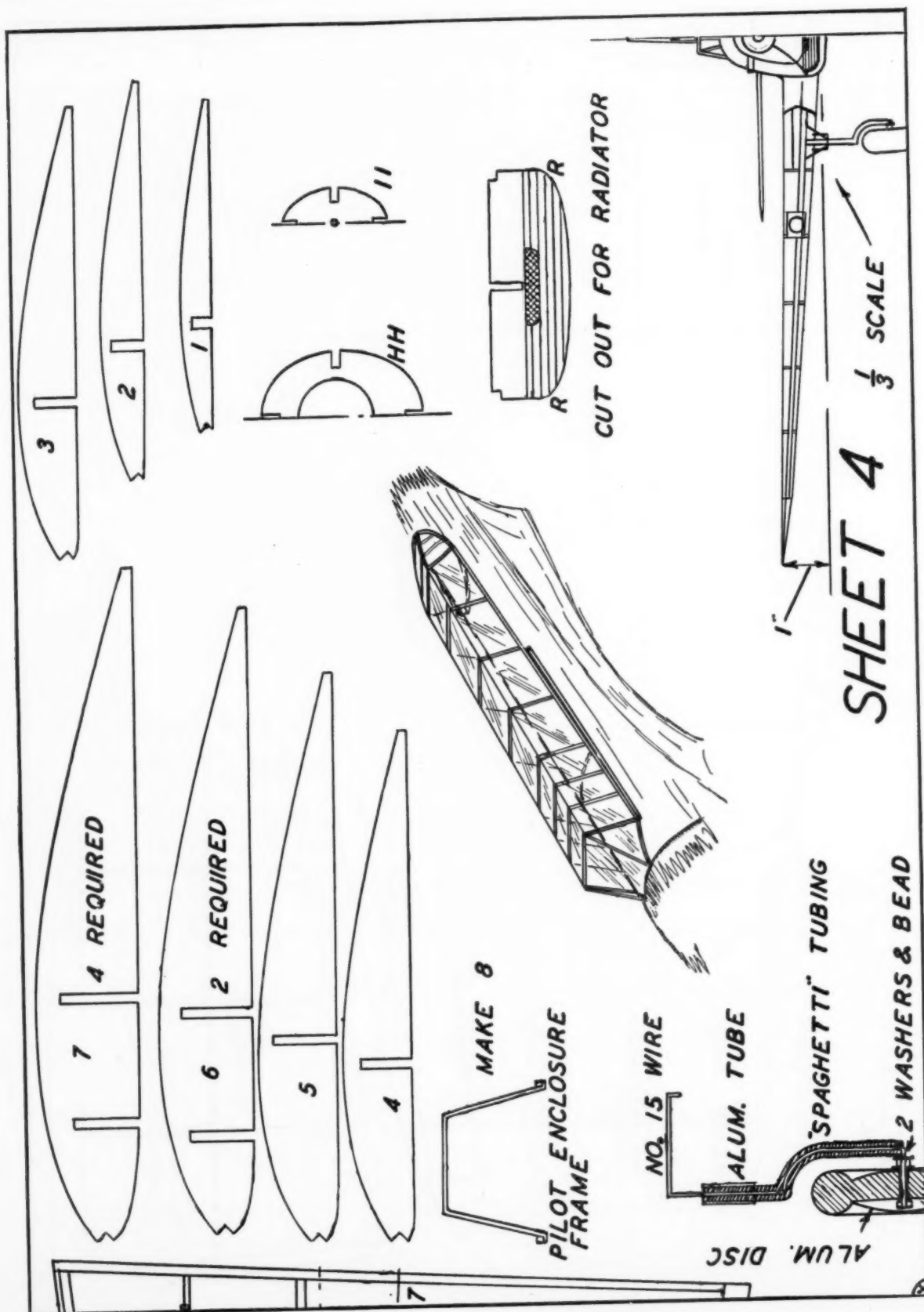
A view of the framework from the underside



The completed frame is light and strong







Designing Your Models for Speed

Chapter No. 5

How to Proportion Your Speed Jobs When Tandem or Pusher Twin Propellers Are Used

Article No. 60

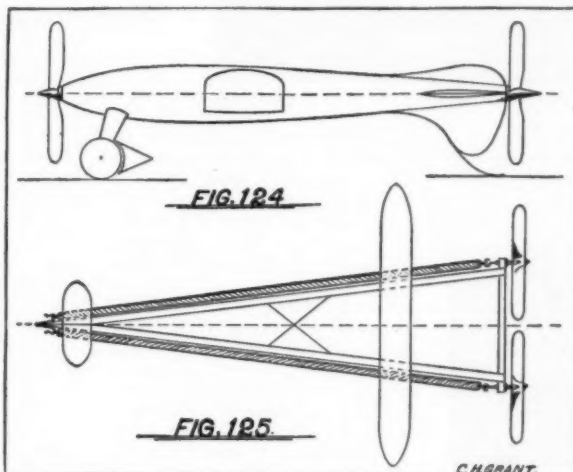
IN THE last three articles of this series, complete information bearing on the design of a tractor speed model has been given. However a brief outline of the qualities and proportions such a plane should have will help to clarify important facts in the mind of the reader whether or not he has read the three preceding articles. Therefore such an outline of rules follows, which gives the general proportions that a speed plane should have as well as the actual measurements of a typical plane.

1. The best type of plane for speed is a twin pusher or a low wing monoplane.
2. In the latter type the C.G., the C.L. and the line of thrust should be fairly close together.
3. The model should be long compared to the span of the wings.
4. The wing span may be of any value, but the most convenient size is from 18 inches to 24 inches, for instance, 20 inches.
5. The aspect ratio should not be large, from about five to seven, as in the design given (5.7).
6. Wing dihedral should be 1 inch to 1½ inch per foot of span rise on each wing tip, as 1 11/16 inches.
7. Angle of incidence, (0) degrees to (1) degree positive, as in the example, (0) degrees.
8. The propeller diameter should be from 30% to 40% of the wing span. In the example of a speed model design given in previous pages a value of 8 inches was chosen.
9. Propeller pitch—one and a half times the propeller diameter; as 12½ inches.
10. Propeller blade area—18% of the wing area, as 10 sq. inches.
11. Fin and stabilizer moment arm, 65% to 85% of the wing span, as 75% or 15 inches.
12. Fin area 10% of the wing area for speed models without pants and wide landing gear struts, and 12% when the model is equipped with them, as in the example, 6.38 square inches.
13. Stabilizer angle—about ½ to 1 degree negative, in the example—1 degree.
14. Stabilizer area 30% to 45% of the wing area, as 35% or 18 sq. in.
15. Length of nose from the center of the wing to the rear face of the propeller hub, 1/3 to ½ the tail moment arm, as 7½ inches.
16. Landing gear should be well streamlined and as short as possible.
17. The whole model should be highly streamlined.
18. A very powerful motor should be used and the body made strong enough to stand it, without being excessively heavy.

Unusual Types of Speed Models

The type of model discussed in the preceding pages was the normal single propeller tractor. There are several other types, however, the design of which is the same basically, but varying from the normal plane in their means of using the power of the motor. One of these is the tandem twin propeller type. In such a plane two pro-

By CHARLES HAMPSON GRANT



pellers are used one directly behind the other, revolving in opposite directions. This arrangement overcomes the objectionable torque which is caused by one propeller. Inasmuch as larger tail areas are required because of the disturbing reaction of the torque, a plane using tandem twin propellers will require smaller tail areas. Actually about 10% less area will be necessary. If the model, the design of which has been outlined, should be equipped with tandem twin propellers it would require 6.38 sq. in. less 10%, or 5.74 sq. inches of fin area. This is equivalent to about 10.5% of the wing area. Also, the stabilizer area required would be 10% less than in average cases, or only 16.2 sq. inches instead of 18 square inches. The design of this type of model is the same as the normal tractor speed model in all other respects.

Twin Propellers—Nose and Tail

The design of some speed models is such that one propeller is located at the nose of the model and a second one at the rear end of the fuselage, behind the tail surfaces. In this arrangement one propeller neutralizes or balances the effect of the other in respect to torque and vertical fin area effect. Let us see what changes in design are required in this type of model. First of all, if the effect of the propeller's gyroscopic action and side area alone is considered, less area than in average cases may be used, as part of the area of the tail surfaces is required to neutralize the disturbing effect of the torque and vertical area component of the propeller ahead of the center of gravity. Under these conditions the tail areas may be the same as in the case of gliders, where no propeller is present.

About one-third of the tail area is used

to overcome the effect of the propeller, so theoretically models of the tandem, nose-tail propeller type may be equipped with

tail surfaces which are only two-thirds as large as in average cases, provided no other change is required in the model's design. If a propeller system of this type is to be used on the speed model outlined previously, the required fin area on this basis would be 2/3 of 6.38 or 4.26 sq. inches, and the required stabilizer area would be 2/3 of 18 sq. in. or 12 sq. inches. However, actually the gyroscopic action of the propellers resist recovery from displacements to a considerable extent. This is due to the fact that though the two propellers, revolving in opposite directions, neutralize the effect of one another about the longitudinal axis, their disturbing effect about the vertical and lateral axis of the airplane is not completely overcome. About 10% of

the tail areas is required to overcome this gyroscopic action of the propellers. Therefore the tail areas should be reduced about 23% instead of 33%. Under these conditions the fin area should be 4.9 sq. in. and the stabilizer area should be 13.8 sq. in.

There is a very important point to consider in the design of this type of model, however. It is the fact that the balance of the model is not the same as in normal on propeller types when a propeller is placed at the rear end of the fuselage. The weight of the propeller and bearing at the rear causes the center of gravity to be located nearer the tail of the plane. Because of this the wing must be located farther back from the nose. This fact shortens the tail moment arm and lengthens the nose. Both of these circumstances make it necessary to have additional tail area to compensate for the more unstable condition they create. The exact amount may be calculated by the formulae given in article No. 59 if one change is made in the quantity in which (D) appears. In the formulae for both fin and stabilizer the quantity is $\left(\frac{D}{S}\right)$. This should be changed to $\left(\frac{D}{3S}\right)$.

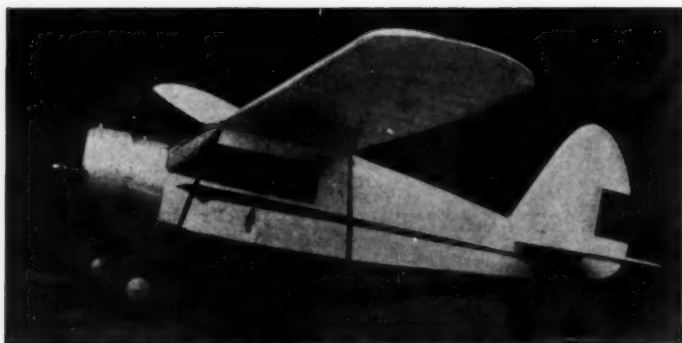
The formulae for fin and stabilizer will read then as follows: Fin area = $A_f = A_r \left(\frac{D}{3S}\right) + (0.067) \left(\frac{A}{M}\right) (3 + N + 0.58 \sqrt{ST_r})$.

Stabilizer area = $A_s = A_r \left(\frac{D}{3S}\right) + (0.67)$

$(2C + N) \left[1 - \left(\frac{2 \times}{5} \left(\frac{Q + M - 2}{5} \right) \right) \right] \left(1 - \frac{(G + 2T)}{4C} \right)$.

In this type of model the balance would be such that the length of the moment arm would be about (12) inches and the nose length would be about (10.5) inches, taking the length of the fuselage specified

(Continued on page 36)



Pict. No. 1. A Denny model built by Ted Koerner. Looks real, doesn't it?

DURING the last month the International Gas Model Airplane Association has experienced a large jump in its membership. Members have joined from many foreign countries as well as from

the United States. Enrollments from California have been especially large, so that at the present time there are over 1500 in this great brotherhood of model builders. In the last two months the number of units in the organization has increased from twenty-three to thirty-seven.

The organization is interested in establishing district or state leaders throughout the country and wishes to appoint responsible men for such positions. Therefore, we are requesting that unit members write in from their various districts and nominate some responsible person who has a thorough knowledge of aeronautics and who they think would be an excellent leader for the

"Gas Lines"

Latest News of Members of the International Gas Model Airplane Assn.
From All Parts of the World



The I.G.M.A.A. Pin

state. Any suggestions will be welcome. If members who write in will also give details concerning the character and experience of the men they nominate, it will greatly help the directors of the I.G.M.A.A. in any decisions they may make.

The usual flood of photographs and news has descended on headquarters this month and we take pleasure in printing some of the contributions which we feel may be of interest to readers. The best looking model which we have received during the month comes from Theodore Koerner of 5312 Summer Avenue, Eagle Rock, Calif. It is shown in picture No. 1 and the model was made from a Denny model kit. Koerner tells us that it is his third gas job and is powered with a Baby Cyclone engine. He says that the plane on its first flight showed excellent performance and stability.

Jack Allen of 626 Sierra Vista Avenue, Alhambra, Calif., sent us picture No. 2, which shows his Allen Turner Special of seven foot wing span, built from plans in MODEL AIRPLANE NEWS. He says:

"I have covered the landing gear with silk and changed the motor mount so an inverted motor may be installed."

The ship now mounts a G.H.Q. motor. When Allen covered the landing gear with silk he may or may not have realized the benefit which he has derived from this procedure, in respect to the flying qualities of the model.

The original model was an excellent flier. However, if all gas model builders covered in the spaces between the struts of their landing gear, in about 90% of the cases the flights would be improved. This is due to



Pict. No. 2. A modified Turner model by Jack Allen. The "filled" landing gear increases stability



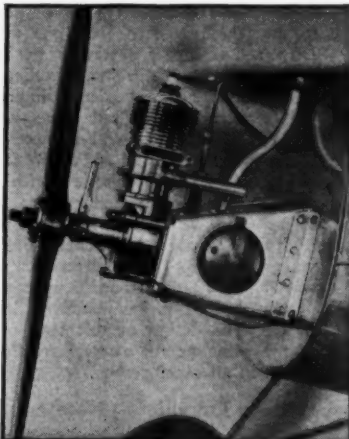
Pict. No. 4. Here's a modified KG built by L. S. Wigdor of England. It has made 85 flights



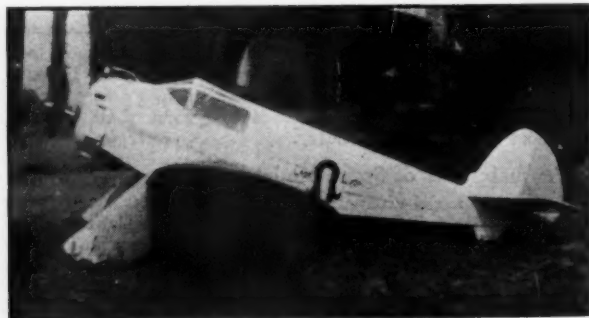
Pict. No. 5. Milton Gomes and his plane. (Brazil)



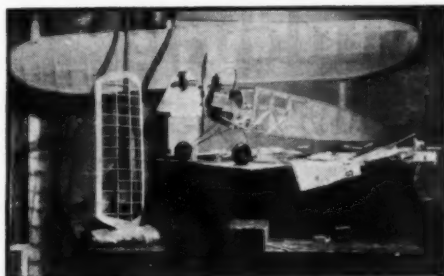
Pict. No. 6. Cause for tears!! Remains of Paul Zakim's gas job, after the crash



Pict. No. 11. This job puts up a good "front" with an Ohlsson motor.



Pict. No. 7. One of the few low-wing gas jobs in existence. It was built by Bud Schiffman



Pict. No. 8. A corner of Francis Stevens' "inner shrine" (workshop to outsiders)

Pict. No. 15. Some of the contestants and their planes at the first Canadian gas model contest



the fact that the center of the lateral area is lowered so that it is closer to a horizontal line running through the center of gravity. In about 90% of the models in existence, the center of lateral area is too high and erratic flights with spiral dives and crashes are the order of the day because of this.

If a gas model is built to the scale of a real ship, with practically no dihedral, the center of gravity and center of lateral area will be fairly close together. However, when model builders build scale models they usually increase the dihedral of the wings and this immediately throws the center of lateral area above the center of gravity. In order to compensate for this condition, it is wise to increase the lateral area below the center of gravity. This may be done by covering in the place between the struts, as Mr. Allen has done. This brings the center of lateral area down to its original position again.

In the past gas model builders have usually adhered to the monoplane type of ship. However builders are now trying their hands at several other types in order to determine the change in flying characteristics. One of these inquisitive builders is Jack Santer of 342 South Austin Boulevard, Oak Park, Illinois. He has built a very good looking sesquiplane, which is shown in picture No. 3. Santer also sends us a picture of the crash of his ship, which occurred after several flights were made. We think it best to spare the nerves of the readers and therefore do not publish it. Santer tells us that he is now rebuilding the ship as a parasol job and is doing away with the sesquiplane idea.

It appears that KGs have invaded England, for Mr. L. S. Wigdor of 2 Windsor Road, London N.3, England,

sends us picture No. 4 showing his ship which is of the KG type. He says:

"Actually there is not an identical measurement between the KG and this plane, but the general layout is the same. The machine up to date has had eighty-five flights in the past two months and has shown itself to be the most stable machine I have ever seen. It is powered with a Brown engine.

"A most important feature of the machine is its demountable properties. The wing is made in three separate sections and the undercarriage and engine unit is movable. The entire section and tail unit also come off.

"A feature of the engine mount is that if it hits the ground it bounces up on rubber shock ab-

(Continued on page 44)



Pict. No. 12. Another KG. This one is flying in South Africa. (By H. Endean)



Pict. No. 3. Jack Santer likes things that are different, so he built this sesquiplane



Pict. No. 13. John Genco with his first gas model. He has built many more since this picture was taken



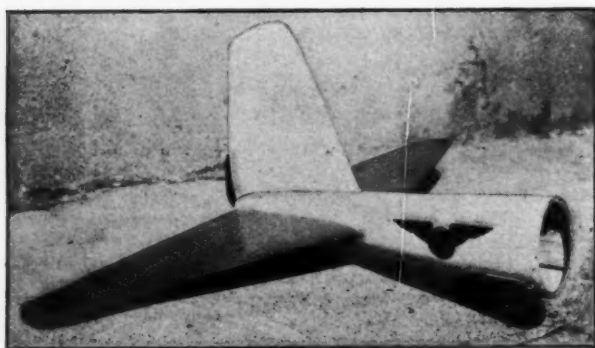
Pict. No. 14. Shura Khlystov of Russia puts his gas job in shape for a contest



Pict. No. 10. Many builders prefer small gas models. Here is Earl Harrison with one that he built



Pict. No. 9. Here's the first gas job triplane we've seen, built by Walter Bobkiewicz



Rear of fuselage with mounted tail assembly

BY LEO WEISS

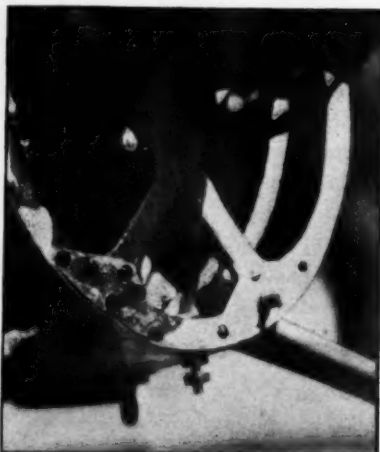
Part No. 2

WE NOW come to the most important constructional feature of the "Aristocrat." While the planking gives a great deal of strength to the structure in addition to maintaining shape, it would be useless without a well-doped silk covering. For this purpose, purchase six yards of the best obtainable China silk. This should be enough for the entire plane. Do not get too light a grade, such as is used on some rubber-powered models and small gas models. A medium grade is desirable.

For the stabilizer and the fin, cut the silk for each side in slightly larger pieces. Cover the bottom of the stabilizer first. Apply the dope, of brushing consistency, OVER the silk. For applying dope, wrap a small amount of absorbent cotton about the end of a long, thin hardwood stick. The cotton absorbs a good deal of dope for sticking the silk to the wood.

Do not work too large a surface at a time. As the dope dries, work the hand over the silk, smoothing out in all directions. This will remove all traces of wrinkles and bubbles in the silk. In case of stubborn wrinkles and creases, use heavy dope or cement and work until dry with finger. Do not lap the edges over on the stabilizer or fin. Cut off the silk edges separately and dope them down.

Before going ahead with anything else, tape the leading edge and tips of the stabilizer and fin. The tape, known as "twilled tape" can be purchased in varying sizes in department stores. Use $\frac{1}{2}$ " tape, in one piece, for the complete edge of each surface. First, apply the heavy dope to about three inches of the edge. Quickly place the tape over it and apply the regular dope generously. Smooth out and stretch with the fingers until the dope has dried or set sufficiently. Working in



Details of the front bulkhead and landing gear mechanism

Building A Streamline Gas Model

How to Cover the Model With Silk and Build the Fuselage of Balsa Wood Planking

this manner you can easily stretch this seemingly heavy tape around all the edges.

Now run over the tape and the silk with very light sandpaper so as to raise loose lint. Apply several more coats of dope, sanding lightly between. If you wish, it might be better to apply but two coats of dope and two or three more of a good grade surfacer or wood filler. Do not use the type employed in automobile finishes, because it is much too heavy. This completes the stabilizer and fin, and now they may be cemented together. To do this, merely apply cement to the lowermost rib of the fin, and place it directly over the center rib on the stabilizer. Hold it in place with pins while drying, frequently checking the angle between the two surfaces to make sure it is 90°.

Wing Silking

Follow the same procedure for the wing as for the tail. There should be little difficulty in applying the directions for the tail surfacing and silking to the wing. Take your time and use care.

The center section of the wing, top and bottom six inches out on either side from the center, should be covered with a total of three coats of silk. After the two 12" square

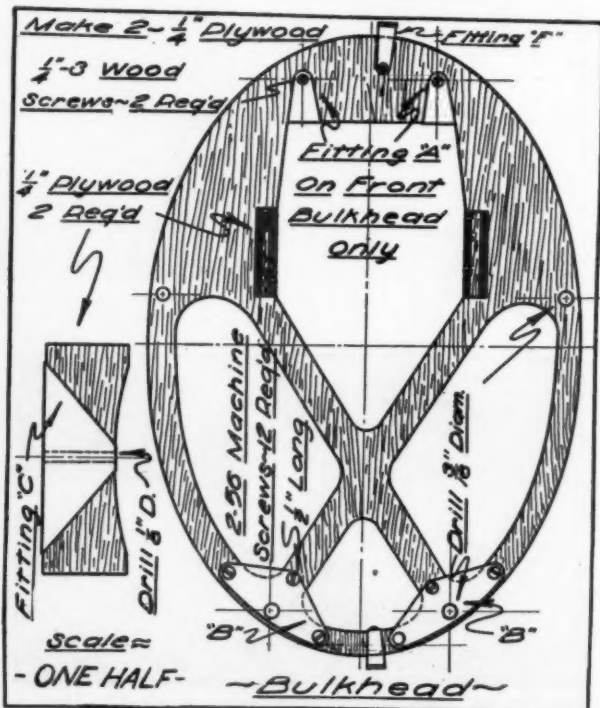
pieces of silk have been applied, cover the seam with tape as shown in the three-view drawing.

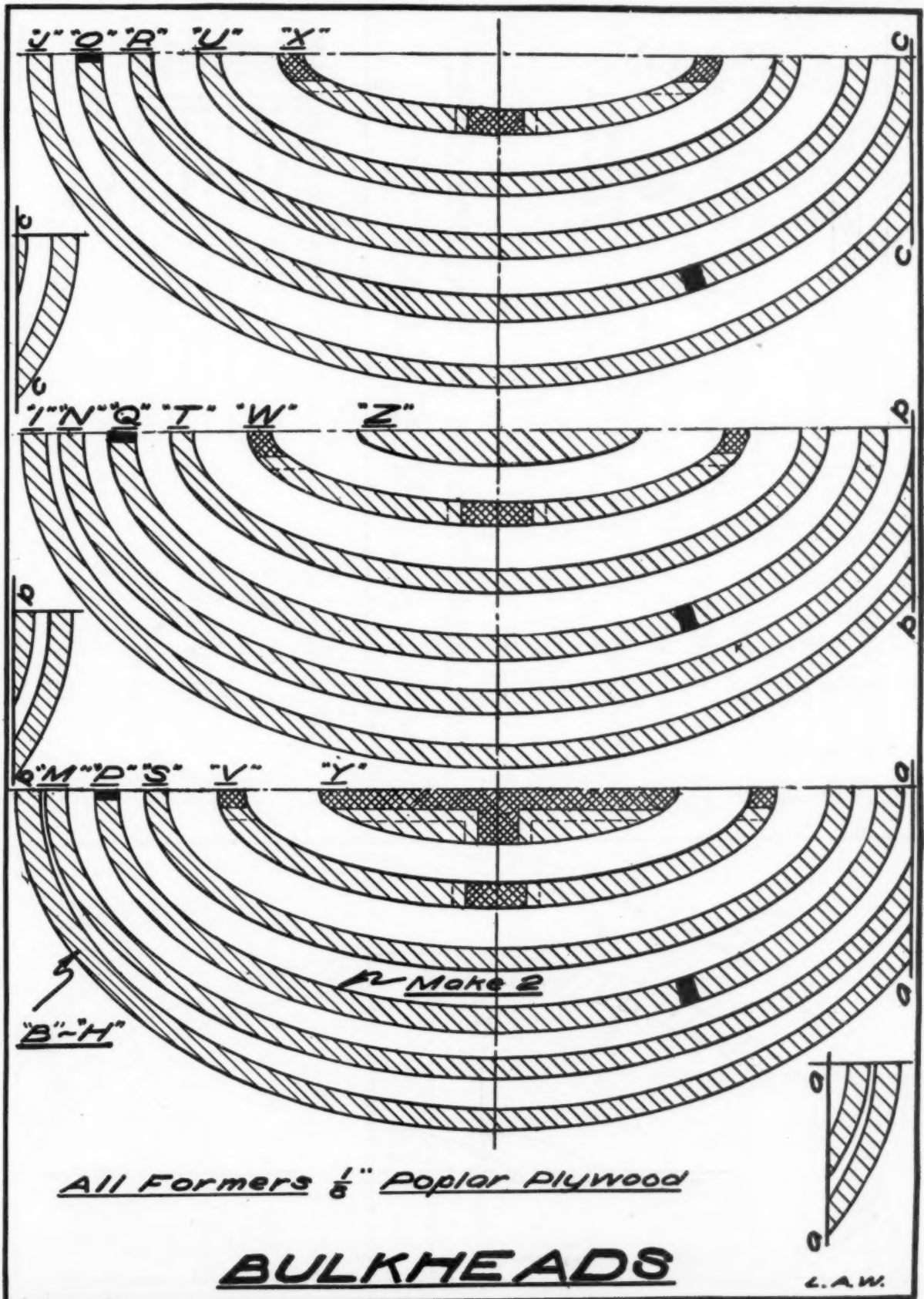
Also tape the leading and trailing edges with $\frac{1}{4}$ " tape. Use but two pieces for this, joined without overlapping at the tips of the wing. Put one piece on, preferably the trailing edge, then cut the end of the second one to fit without overlapping when you have worked up to it. Dope three adjoining pieces of $\frac{1}{4}$ " tape to the bottom of the center section, run-

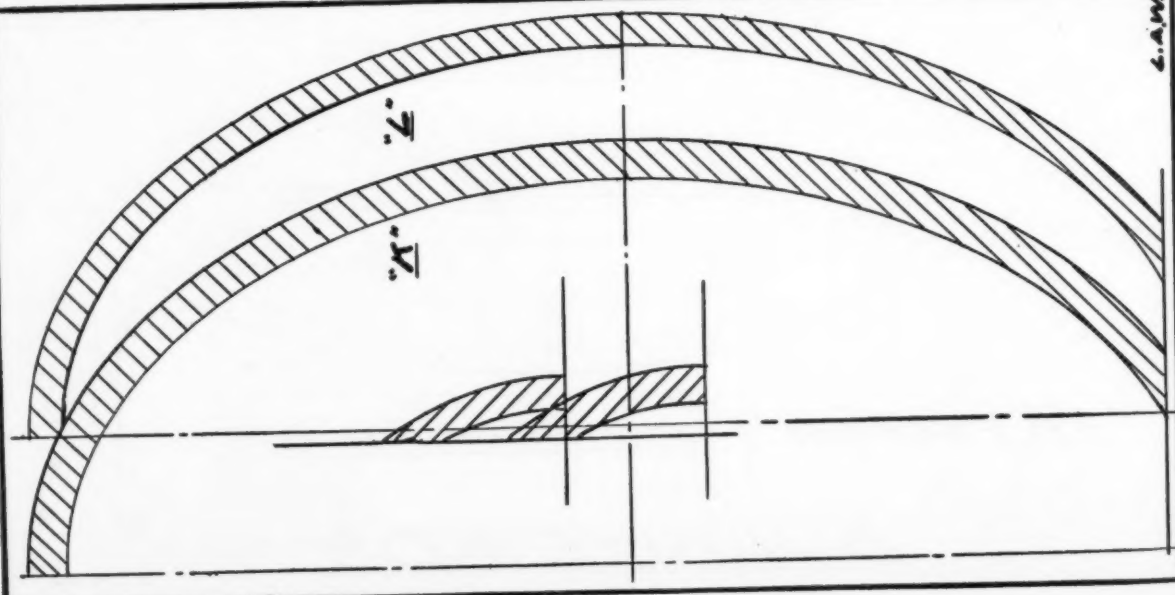
(Continued on page 32)



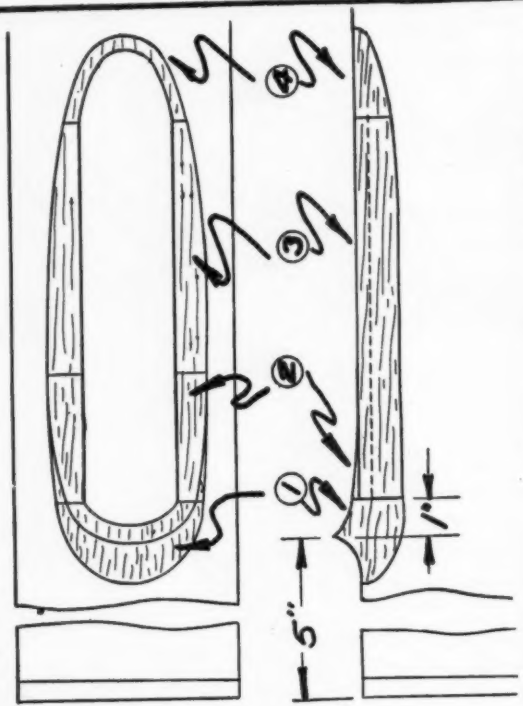
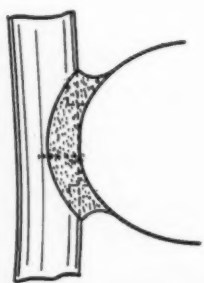
The tail assembly and rear of fuselage attached to the model







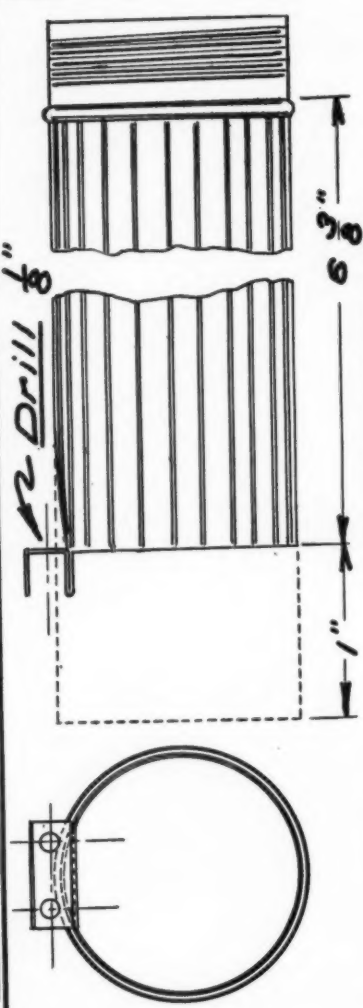
- ① 2" x 1 3/4" x 3 3/4"
 - ② 5" x 3" x 3 3/4"
 - ③ 9" x 1" x 3 3/4"
 - ④ 1" x 2" x 2 3/4"
- Hard Balsa**



Use Wing Template "1" To Shape Fillet

1/4 Full Size WING FILLET

L.A.W.



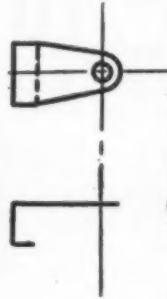
BATTERY CASE

Full Size

L.A.W.

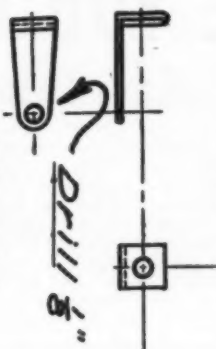
L.A.W.

Fitting "A" *Fitting "B"*



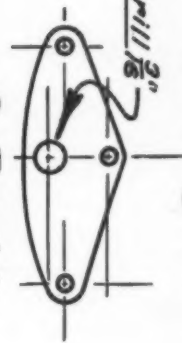
2 Req'd
.020 Brass

Fitting "F"



3 Req'd
.020 Brass

Drill $\frac{3}{8}$ "



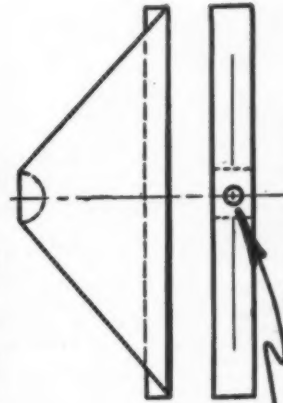
8 Req'd
.020 Brass

Fitting "E"



6 Req'd
 $\frac{1}{8}$ " Steel

Fitting "C"



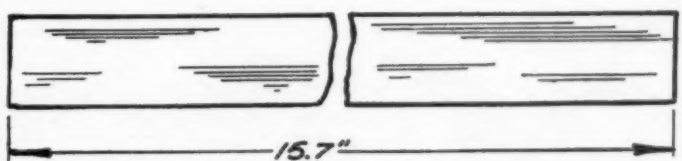
2 Req'd
.020 Brass

Fitting "D"

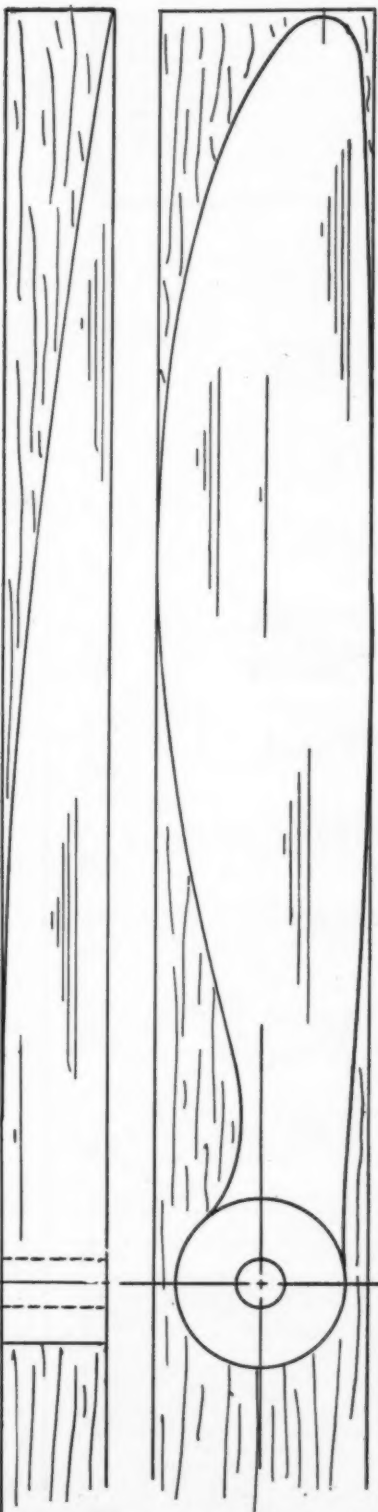


2 Req'd
.006 Brass

Cover Band



One Req'd
.006 Brass



PROPELLER

L. A. W.

Another
Great
C-D Step



TO SAVE YOU MONEY!

on the
rise in
prices

All SF 3/4" Are Now "DRY" ★

Since rising prices on raw materials throughout industry in general have made it imperative to raise prices—we of Cleveland have delayed this move as long as possible. Last month we announced prices were going up Feb. 1st—but now we've hit upon a plan of avoiding to some extent this price rise on SF 3/4" Kits—namely, to supply them WITHOUT LIQUIDS. This brings you two very desirable advantages: 1, you may buy liquids in larger quantities and thus enjoy lower prices; 2, you may choose your own colors for the particular models you are building. All in all, this move will be highly acceptable to most modelbuilders—for it brings these famous 3/4" Kits—the most outstanding line of models in the world—absolutely within everybody's reach. Pictured below are many of these C-D models—others not shown here are listed in the complete C-D list appearing in the lower center of the page. Be sure to order the ones you want right away. If your dealer can't supply you, order direct. And don't fail to get the 2nd Edition of our Hobby Catalog—10c—ready early in Feb. Spring Supplement and R. R. Announcement, to follow later, 5c extra.



**GR. LAKES
SPORT TRAINER**
Span 20". Very pretty.
Sug. col.: orange and
cream. Kit SF-1, only **\$1.95**



**TRAVEL AIR MYSTERY
SHIP**
Span 21 1/2". Suggested
coloring: red, black scal-
loping, green trim. Kit
SF-2, only **2.35**



DE HAVILLAND 4
Famous T-1. S. Fighter.
Span 31 1/2". Sug. col.:
olive drab, red and white.
Kit SF-3, only **2.85**



**DOOLITTLE'S LAIRD
SUPER SOLUTION**
Span 15 1/2". Sug. col.: yellow
and green. Kit SF-5, only **1.95**



ARMY BOEING P12-E
Popular fighter. Span
22 1/2". Sug. col.: yellow
and olive drab. Kit
SF-8, only **2.25**



**GENUINELY
REALISTIC
SCOUTING SE-5**
Excellent flyer. Span
20". Sug. col.: Natural
cream color. Kit SF-9, only **1.25**



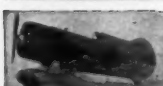
**RICKENBACKER'S
SPAD XIII**
Span 19". Sug. col.: yellow
and green. Kit SF-15, only **1.95**



**VON RICHTHOFFEN'S
FOKKER TRIPLANE**
Span 17 1/2". Length 9 1/2".
Sug. col.: all red. Kit
SF-14, only **1.95**



**FOKKER D-7
FIGHTER**
Span 21 1/2". Sug. Col.:
orange, green & white.
Fine flights. Kit SF-15,
only **2.50**



**'31 BAYLE'S
GEE-BEE**
Span 17 1/2". Length 9 1/2".
Sug. col.: yellow and black.
Kit SF-17, only **1.95**



**HOWARD
'PETE'**
Race model. Span 15".
Sug. col.: all white. Kit
SF-18, only **1.25**



BOEING 247 TRANSPORT

The ship we all read so much about in daily papers. Model span 55". Wizard for flights. Powerful. High speed. All curved wood printed out, "filled in" fuselage, balanced controls, etc. Gray colored. Large 17"x14" drawings, and data. **5.95**
Kit SF-35, only



**SUPERMARINE
S.S.B.**
Will R.O.W. Span 22 1/2".
Length overall 14 1/2". Sug.
col.: silver and blue. Kit
SF-19, only **1.95**



HAWKER FURY
England's Interceptor
Fighter. Span 22 1/2". Sug.
col.: all silver. Kit SF-20,
only **1.95**



HAWK P6-E
Famous T-1. S. fighter.
Span 23 1/2". Sug. col.: yellow,
O. drab (or blue) blk.
and white. Kit SF-21, only **2.50**



BOEING P-26
Very popular. Span 21 1/2".
Sug. col.: yellow, O. drab
(or blue). Kit SF-23, only **1.95**

Doggliest Army Fighter Yet!



New C-D P26-A Fighter
Model is dazzling with its yellow wings, blue fuselage and gorgeous red and white scalloping and stripes. Radio antennae adds unusual smartness. High speed flyer. Its span is 21". Kit SF-60, complete except no liquids, only \$2.85 (Kit D-60, \$1.10).



LOCKHEED VEGA
Span 30 1/2". Sug. col.:
brilliant red and cream.
Kit SF-24, only **2.50**



HEATH PARASOL
Span 23 1/2". Sug. col.:
orange, black. Excellent
for beginners. Kit SF-26,
only **1.25**



**DOOLITTLE'S GB
SUPERSPORTER**
Span 18 1/2". Sug. col.:
white, red scalloping. Kit
SF-27, only **1.95**



**MONOCOQUE
SPORT**
Span 24". Sug. col.:
cream and orange. Won
many first prizes for model-
builders. Kit SF-28, only **1.95**



**BOEING FAB-3
FIGHTER**
Standard Navy equipment.
Span 22 1/2". Sug. col.:
silver yellow and red.
Kit SF-29, only **2.25**



BOEING 95 MAIL
Easy for beginners, span
33 1/2". Sug. col.: blue and
silver. Kit SF-32, only **1.95**



COMPER SWIFT
Excellent flights. Span
18". Sug. col.: green and
black. Kit SF-33, only **1.25**



**LINCOLN
SPORTPLANE**
Beginner's model. Span
15". Sug. col.: cream,
black trim. Kit SF-36, only **95c**



**WACO C-3 CABIN
PLANE**
Span 24 1/2". Sug. col.:
silver and red. Kit SF-37, only **2.65**



AERONCA C-3 SPORT
Easy for beginners, span
27". Sug. col.: red and
silver. Kit SF-40, only **1.95**



**VUGHT CORSAIR
V-65**
The executive design.
Span 26 1/2". Sug. col.: silver
and blue. Kit SF-41, only **2.95**



**HOWARD RACER
'IKE'**
Good beginners model.
Span 15 1/2". Sug. col.: all
white. Kit SF-42, only **95c**



**DOUG. O-38
OBSERVER**
Snappy National Guard
Trainer. Span 30". Sug.
col.: yellow and olive drab
or blue. Kit SF-43, only **2.95**



LAIRD SOLUTION
Very pretty appearance.
Span 15 1/2". Sug. col.:
gold and black. Kit
SF-46, only **1.95**



WEDELL'S W. WMS.
Highly detailed. Span
19 1/2". Sug. col.: red and
black. Kit SF-47, only **2.35**



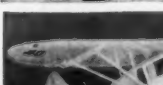
TURNER'S W. WMS.
Very popular. Span 19 1/2".
Sug. col.: all gold. Kit
SF-48, only **2.35**



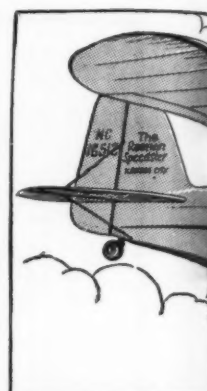
**CURTISS F11C-2
GOSHAWK**
Extreme well detailed.
Span 23 1/2". Sug. col.:
gray, silver, yellow and
red. Kit SF-49, only **2.95**



TURKEY HAWK
Also Export Hawk. Span
23 1/2". Sug. col.: silver and
red. Kit SF-50, only **2.95**



HOWARD 'MR. MULLIGAN'
Fast flying model. Nothing compares with it in
elaborate completeness—opening door, super detailed
motor and gadgets, etc. Span 23 1/2". Kit SF-52,
complete (except NO LIQUIDS). Sug. Col. **2.35**
all white; post free only.



The First

2nd Edition of the C-D Hobby Catalog

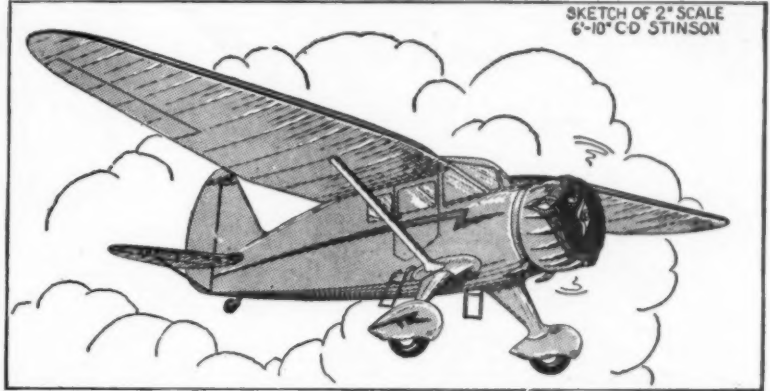
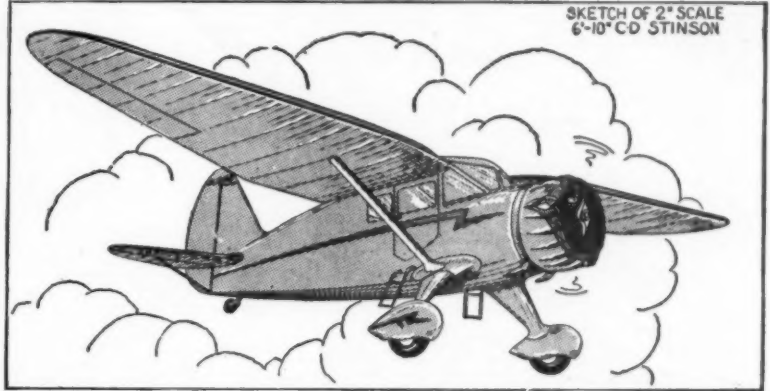
The over-whelming request for the 1st edition completed exhausted its long before Christmas. Edition No. 2 (ready early Feb.) is bigger and better, 64 pages, those who remitted 10c for No. 1 and did not receive it will automatically get No. 2. Many new items. Don't delay. Supply limited—this one will go fast, too. Send your 10c today to cover cost of mailing and packing. Add 5c extra, and you'll be put on the mailing list for the Spring Supplement and R.R. announcement to follow. If Ordering Kits—be sure to enclose 10c extra for catalog. Add 5c more, and you'll automatically get the Spring Supplement (will appear later).

For No. 1 and did not receive it will automatically get No. 2. Many new items. Don't delay. Supply limited—this one will go fast, too. Send your 10c today to cover cost of mailing and packing. Add 5c extra, and you'll be put on the mailing list for the Spring Supplement and R.R. announcement to follow. If Ordering Kits—be sure to enclose 10c extra for catalog. Add 5c more, and you'll automatically get the Spring Supplement (will appear later).

The Great C-D "AIR" KIT

All kits are NOW Dry—no liquids discontinued. Just remit 10c below.

NO.	NAME	PRICE
1	Gr. L. Sport Trainer	1.10
2	Travel Air Mystery	2.35
3	DeHavilland 4	2.85
4	Curtiss JN-4 "Jenny"	1.95
5	Polish Fighter	1.95
6	Curtiss Helldiver	2.35
7	Army biplane	1.95
8	Scouting SE-5	1.25
9	Scouting Camel	1.25
10	A.W. Quad	1.25
11	Blushof's Newport	1.95
12	Boeing P-12	2.25
13	Fokker Triplane	1.95
14	Fokker D-7 Fighter	2.50
15	Albatross D-5	1.95
16	Bayler's Gee-Bee	1.95
17	Howard "Pete"	1.25
18	Supermarine S6-B	1.95
19	Hawker Fury	2.25
20	Hawk P-6-E Fighter	2.50
21	Macon Fighter	1.95
22	Boeing P-30 Pursuit	1.95
23	Lockheed Vega	2.50
24	Curtiss A-4	1.95
25	Heath Parasol	1.25
26	Doolittle's Gee-Bee	1.95
27	Monocoque Sport	1.95
28	Boeing FAB-3 Fighter	2.25
29	Nieuport 28 Fighter	1.95
30	Hall Racer	1.95
31	Boeing 95 Mail	1.95
32	Comper Swift	1.25
33	Fokker D-8 Fighter	1.95
34	Boeing 247 Transport	5.95
35	Lincoln Sportplane	95c
36	Waco C Cabinplane	2.65
37	Buhl Bull Pup	1.95
38	B-1 P-16 Fighter	1.95
39	Vought Corsair V-65	2.95
40	Howard "Ike"	95c
41	Douglas O-38 Observer	2.95
42	Page's Racer	1.95
43	Marin Bomber	1.95
44	Laird Solution Racer	1.95
45	'33 Wedell's W. Wms.	2.35
46	'34 Turner's W. Wms.	2.35
47	Curtiss Goshawk F11C-2	2.95
48	Curtiss Export Hawk	2.95
49	51 D. H. Comet Racer	2.95
50	52 Grumman F2F-1 Fighter	2.95
51	Hughes H1-Speed Racer	2.95
52	Douglas Transport	5.95
53	Consolidated A-11	2.95
54	Old Gr. L. Trainer 211-E	2.95
55	Ryan ST	2.95
56	Hawker Low Wing Fight	2.95
57	Boeing P30-A	2.95
58	Seversky Fighter	2.95
59	Custom Waco C-3	2.95
60	'36 Caudron Racer	2.95
61	Becherstaff C-17-B	2.95
62	Lockheed Electra	2.95
63	Stinson Reliant	2.95
64	Fairly Battle	2.95
65	'17 Bristol Fighter	2.95
66	A Pontoon Kit—Amphibian	2.95
67	R-X5001 Cleve. Amphibian	2.95

SKETCH OF 2" SCALE
5'-4-1/2" C-D REARWINSKETCH OF 2" SCALE
6'-10" C-D STINSON

Commercially Produced Authentic Scale Models for Gas Power—Just in Time for Spring Flying

After thousands of requests that we design really worth-while gas models to scale, we are offering these two—suitable for either beginners or one well versed in the art of making and flying gas models. Both are suitable for powering with any of the C-D Tom Thumb series motors, Baby Cyclone, Brown Junior, or any motors of similar size. Of course the performance will vary with the engines used, for with the various sizes of engines (bore and stroke) the power will change and consequently affect the performance of the model. The best performance will of course be made with motors of 1/4 bore.

We regret that our experimental models were not yet ready for photographing so these sketches had to be employed. We shall try the best we possibly can to show the actual photographs at the earliest possible date, but we back this with our word, that the models shall look precisely as shown here, our C-D guarantee.

In accordance with our gas model policy these Dry Kits are sold without wheels, wheelshoes, and the complete power unit. Thus you have your own choice of colors, wheels and motors. Likewise wheelshoes may or may not be employed. These kits come complete with full sized drawings approximately 25 sq. feet, "Bam-

boo" tissue for covering, thick celluloid for windshield and cabin windows, heavy music wire, not spring wire, aircraft specification plywood, aluminum tubes and sheets, select hard balsa and pine, or basswood sheets and strips, also all the necessary screws, brads, small diameter wire, etc., etc. It is not necessary to buy everything at once to start your plane. We suggest the kit and a 1/2 pt. can of wood cement to start. When other items are ordered separately, a packing charge of at least 15c must be paid. Models ready early March. Shipments, "First come—first served."

REARWIN SPEEDSTER GAS-POWERED MODEL (above left)

The Rearwin model is colored all silver with brilliant red striping and black lettering. Span is 64 1/2". Order Dry Kit GP-67, only \$4.85 postfree in U.S.

STINSON RELIANT TAPER WING (above right)

We suggest coloring to be all-silver with a deep blue trimming. Span is 82". Order Dry Kit GP-66, only \$8.50, postfree anywhere in the U.S.

★ ★ ★ GAS-POWERED MODEL PARTS AND SUPPLIES ★ ★ ★

AIR COOLED ENGINES COMPLETE AS FOLLOWS:

With plug, coil, condenser and gas tank but no propellers or batteries.
Baby Cyclone New 1937 Model "D" 1/4" Bore, 13/16" Stroke \$17.25
Brown Jr. Motor, 1/4" bore, 1" stroke 21.50
Foster Bros. Model "A" 1 1/16" bore, 1 1/4" stroke 17.75

Cleveland "Tom Thumb" 1/4" bore, 13/16" stroke No. 1 upright or No. 2 inverted 17.25
Mighty Midjet or Gwin Aero. 17.25
Cleveland "Tom Thumb" kits (orders shipped only in order of receipt) 9.75

All engines and kits are Postfree.
QUALITY LAMINATED PROPELLERS (All Engines)
R.H. 1/4" Bore: 12" Dia. — \$1.85; 13" Dia. — \$1.75;
14" Dia. — \$1.85

Super-Quality Laminated Propellers (For All Engines)
14, 15, 16, 17, 18, 19 and 20" diameters, each \$2.75
Birch Baby Cyclone Propeller 13" Diameter 1.50
Pine Tom Thumb 12" Propeller Blank .35
Pine Brown Jr. 14" Propeller Blank .45

MISC. "GAS" ACCESSORIES
4 Wheel axle halves routed for 3" to 3 1/4" wheels \$0.85
Balsa Wheels 3 1/2 x 1 1/4" with bronze bearing for 3/32" or 1/4" music wire, pair 1.25

3 1/4" M & M Wheels, pair 3.50
3 1/2" M & M Wheels, pair 3.75
4 1/4" M & M Wheels, pair 4.50
4 1/2" M & M Wheels, pair 4.50

A Grade Silk per sq. yard .30
AA Grade Silk per sq. yard .40
(Silk-Rearwin takes 2 yds.; Stinson 4 yds.)

Stripping tape 1/4" wide—10 ft. on card .15
1/2 pt. wood and paper cement .55
1/2 pt. C-D colored dope choice of any colors except bronze and gold .55

1 pt. C-D colored dope choice of any colors except bronze and gold .95
Midjet Knife Switch single pole, single throw 25c, double throw .35

Midjet tip jacks, each .60
Midjet tip plugs solderless type, 9c, soldering type, 2 for .05

Junior sprayer, postage extra for 1/2 lb., each .49
Senior sprayer, postage extra for 1 1/2 lbs., each .79
3 in 1 modeler's screwdriver .15

Packing Charge: if nothing over 1 lb. is ordered, 15c. Up to 36", 30c; up to 72" 50c. Packing charges must be included or all material will not be shipped. If more than 1/2 pt. of liquids is ordered, an extra 15c packing charge is made for each additional 1/2 pt.; if over 1 qt., send only one regular length packing charge and we will ship by express, charges only "collect" (cheaper). NO C.O.D.'s

FINEST QUALITY MUSIC WIRE

No.	Dia.	18" Long	3 Ft. Long	6 Ft. Long
20	.043(3/64)	—	.09	.18
28	.063(1/16)	—	.12	.23
29	.075(5/64)	—	.14	.25
34	.094(3/32)	—	.16	.28
36	.125(1/2)	—	.18	.30

SPRING STEEL WIRE
This is a tough grade of steel wire. We offer this wire for those who do not require the bending quality or strength of music wire. This wire is often sold as "music wire" which of course is unfair. Straightened and tinned (looks exactly like music wire.)

	3 Ft.	6 Ft.
3/32" dia. (.091)	\$1.12	\$2.24
1/16" dia. (.062)	.15	.30

Packing on sizes up to 5/64 we can bend in half for mailing. On sizes 3/32 and 1/4 dia. if you want them straight be sure to send the correct packing charge or we reserve the right to bend it sharply or supply two 3 ft. pieces.

BRASS TURNBUCKLES
Fork End Turnbuckles have one eye and one fork end with tiny bolt for fastening to metal brackets.

Body Length	Take Up	Two Eyes	Fork End
11/16"	.25	.25	.25
15/16"	.25	.25	.30

ALUMINUM SHEET

Gage thick	6x6"	6x12"	12x12"
34 .006	\$.08	\$.14	\$.25
30 .010	.10	.17	.30
26 .016 (1/64")	.11	.19	.35
20 .032 (1/32")	.14	.24	.55
16 .050 (3/64")	.28	.50	.95
14 .064 (1/16")	.32	.60	1.10

PURE SHEET BRASS

Thickness	6x6"	6x12"	6x15"
1/64" (.015)	Soft .06	\$.10	\$.18
1/32" (.032)	Half Hard .12	.22	.40
1/16" (.062)	Half Hard .18	.34	.65
1/8" (.125)	Half Hard .20	.37	.70
3/16" (.187)	Half Hard .24	.40	.75

BRASS WASHERS

O.D.	Hole	Thickness	Per Doz.
3/32" (.105)	.020	.05	.05
1/16" (.062)	.015	.05	.05
3/16" (.187)	.036	.08	.08
1/4" (.250)	.040	.12	.12

ROUND AND FLAT HEAD BRASS WOOD SCREWS

No.	0 x 1/4"	12 for .05	Gross
No. 0 x 1/2"	12 for .05	.65	
No. 1 x 3/8"	8 for .05	.74	
No. 2 x 1/2"	7 for .05	.90	
No. 2 x 3/4"	6 for .05	1.00	

SEAMLESS ALUMINUM TUBE

O. Dia.	Wall	Ft.	O. Dia.	Wall	Ft.
1/32"	.010	\$.25	7/32"	.010	\$.15
3/64"	.010	.23	.010	.15	
1/16"	.010	.10	.010	.12	
3/32"	.010	.10	5/16"	.035	.13
1/8"	.010	.10	.035	.14	
5/16"	.010	.13	.045	.16	
3/10"	.035	.10	.065	.18	

SEAMLESS BRASS TUBE

O. Dia.	Wall	Ft.	O. Dia.	Wall	Ft.
1/16"	.010	\$.10	3/16"	.010	\$.12
3/32"	.010	.10	.035	.14	
1/8"	.010	.10	5/16"	.035	.16
			.035	.18	

ALUMINUM ANGLE

1/4 x 1/4 x 1/16"	1, 2 or 3 ft.—per foot.	\$.15
1/2 x 1/2 x 1/16"	1, 2 or 3 ft.—per foot.	.20

BRASS ANGLE

1/4 x 1/4 x 3/64"	per foot.	\$.18
5/16 x 5/16 x 3/64"	per foot.	.20
3/8 x 3/8 x 3/64"	per foot.	.22
1/2 x 1/2 x 3/64"	per foot.	.25
3/4 x 3/4 x 3/64"	per foot.	.25

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The British Westland Cooperation plane, by Norman Barker

AIR WAYS

HERE AND THERE

What Readers Are Doing to Increase Their Knowledge of Aviation in All Parts of the World. Results of Air Ways Design Contest No. 2

Notice Air Ways Club News

THE first thing of importance this month is the news of the Air Ways Club Design contest. Many young designers have been anxious concerning the results of their efforts to design a stability model with good duration. This was the problem which was presented. First of all, the model must be stable. Secondly, it must be designed for duration.

We are very pleased to announce that Mr. M. E. Borden, Jr., member No. 971, placed first in the contest. He will receive an award of \$20. The plans of his little ship, as he presented them, are shown on the next page. Borden's ship was very close to being a perfect design. It is quite possible that the center of lateral area would be slightly above the center of gravity but not enough to do any great harm.

He has supplied his model with wheels of considerable diameter and this tends to offset the large area of the fin above the fuselage. Its center of lateral area could have been lowered slightly if part of the fin had extended down below the fuselage, or if the fuselage had been made deeper at the rear of the plane. Its pendulum stability which helps the lateral and longitudinal stability of the ship is excellent due to the large distance between the center of lift and center of gravity. The wing is about in the correct position. If it had been further forward, heavier wheels would have had to be added. This would have dropped the center of gravity below the center of lateral area. We mention this point here as it is noted that Mr. A. J. McRae Jr., who got ninth place, made this mistake. In McRae's model, the wheels are directly under the leading edge of the front wing, which was well toward the nose. This would make it necessary to

have wheels which were exceptionally heavy in order to have the plane balance. In this case the center of gravity would be lowered considerably and would be well below the center of lateral area.

In Mr. Borden's model the moment arm is slightly shorter than half the wing span. However, the stabilizer is of such size that it compensates for this. The model mounts a nine inch propeller which should give the ship excellent duration and climb.

There is no other designer whose design was as perfect as that of M. E. Borden Jr. The only fault that might be found with this entry was a certain lack of neatness in the printing. One of the features of the model was the manner of detailing the nose and tail plug and the wing spars.

Second place was won by Harvey Doering of 1238 South Eastern Avenue, Los Angeles, California. Doering's model is of exceedingly clever design. The center of lateral area is fairly low. However, this model has not the pendulum stability or the distance between the center of gravity and center of lift that Mr. Borden's model has. For this reason it would be a little more critical longitudinally and laterally. Mr. Doering has very cleverly

arranged the design of the fuselage so that the rubber motor slants downward toward the rear. In this way the rear of the fuselage and fin may be dropped, which helps to lower the center of lateral area. The span of the wing is pretty large compared to the tail moment arm; possibly a little shorter span would have been better. Nevertheless the tail surfaces are of good size and may offset this to some extent. The drawing is very neat and carefully made. This model, in respect to the center of lateral



Pict. No. 1. Believe it or not, this is only a model Boeing No. 203 Trainer, built by Harvey and Howard Doering



Pict. No. 2. A Lockheed Electra with electric motor-driven propellers and other details, by Dick Anderson



Pict. No. 5. One of the best posed pictures we have seen. It's a model Aeronca by Ralph Collmann



Pict. No. 6. Mr. Kitamura of Tokyo Model Airplane Club and Miss Mikanii hard at work

Pict. No. 8. Winners of a recent contest in Modena, Italy, and their models, ranging from gliders to gas jobs



Several ships of excellent design otherwise were eliminated from the list of winners because of the excess of dihedral used which brought the center of lateral area a large distance above the center of gravity.

Mr. Glinke's drawing lacks detail of presentation. No drawing was given for the propeller and other refinements. However, this is helped by the fine design of the ship.

Mr. Jerome Ulrich of 1003 Seventh Avenue North, St. Cloud, Minnesota, wins sixth place. He is member No. 769. His ship was unusual in many respects. First of all it had a high parasol wing. Though this tends to raise the center of lateral area, it was compensated for by exceedingly large wheels. The thrust line is high and the center of gravity well below the center of lift. As a design this ship stands up with the rest of the winners. However, Mr. Ulrich's drawing was very poorly made and poorly presented. We advise all entrants in future contests to use India ink instead of blue ink, as Mr. Ulrich did.

Seventh, eighth, ninth and tenth places were won respectively by Carl Mortenson, No. 634; R. Dietz, No. 936; A. J. McRae, Jr.; and J. R. Youngman, No. 471. The winners of fifth through tenth places each won \$2.

All of these entries were excellent and showed careful planning of the models. We congratulate every one of the winners. Many of the other models were presented in fine fashion. However, each one of them ignored one or more important factors of design. Some of them were: too much dihedral which raised the center of lateral area, too slim a body which raised the center of lateral area, too high a fin which had the same effect, and other minor faults.

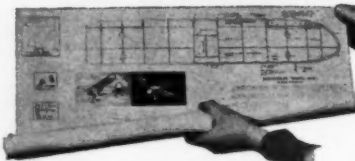
Next month the third design contest will start. The problem will be to design an efficient speed model. Plans will appear in that issue for a model designed by Mr. Grant, which may serve as a guide in respect to many points of design. Get on your toes and be ready for this one.

Now for our regular monthly news which many are waiting for, we are sure. Mr. Norman Barker of 139 Evans Avenue, Toronto, Ontario, Canada, "crashes through" as usual with a very fine drawing of an English Westland Cooperation plane. The work on this is remarkable. Artists may well take note of the technique used and the manner of obtaining the highlights on the propeller and other metal surfaces.

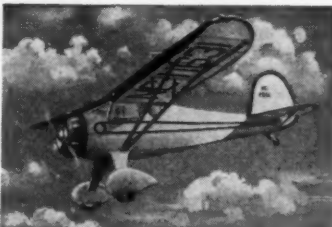
The evidence of one of the most unusual feats of model building has been brought to us by picture No. 1, which shows a Boeing No. 203 Trainer detailed scale model, built by Harvey and Howard Doering of 1238 South Eastern Avenue, Los Angeles, Calif. This looks more like a real ship than any model we have ever seen. In fact we have been at a loss to find any missing detail or deformation of detail which might indicate that it is a model and not a full size plane. The Doering brothers state definitely that this is a model so we take their word for it. We say without reservation that this piece of work is the finest we have seen.

(Continued on page 42)

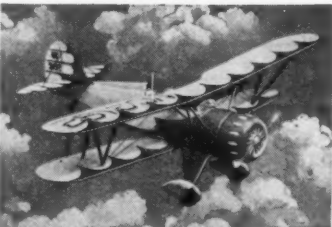
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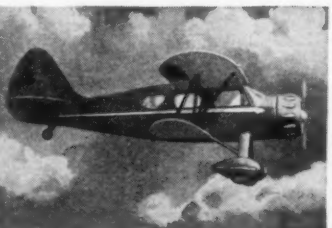
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1/2x3/8\$4.00
1/2x1/2\$5.00
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1/4x3/8\$8.00
1/4x1/2\$9.00
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BEAUTY! A good and efficient looking ship; colored white with red and black flares on wing and tail surfaces.

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1 pr. 3 ½ inch Pneumatic Rubber Wheels; Complete Printed out Wood including ribs, bulkheads, wing tips, rudder sections, etc., all strip Wood of finest quality accurately cut to size and ample quantity to build complete model; bamboo covering paper; hard wood propeller blank; rubber; complete set of hardware including nuts, bolts, landing gear brackets and heavy wire; battery wire; washers; etc., 8-ply birch veneer for covering nose; strip spruce for reinforcing parts; large can gas model cement; and streamlined tail wheel; complete set of numerals, insignia and lettering for wings and tail; 2 large sheets of Full Size Plans with instructions, photographs, diagrams and detailed illustrations—everything you need to build this wonderful gas model . . .

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Formerly of
The Technical Section, Air Service, U.S. Army

FOR several months there has been a lull in the barrage of "shots" fired at the Advisory Board editor. However, it appears that model builders are renewing their questioning.

Ernest Louie of 2160 East 78th Street, Cleveland, Ohio, seems to be in difficulty concerning parasoling a wing on his stick job, for he asks:

Question: How can I find the parasol on a stick model?

Answer: Mr. Louie's question inspires one to be facetious, however we will take it seriously. We presume that he means the proper amount of parasol effect on the wing.

There are several factors which must be carefully considered in regard to stability. Often by increasing one or two of these factors, you detract from another one. It is true in this case. If the wing is parasoled on a stick model, usually longitudinal and lateral stability will result. These two types of stability are increased enormously by this procedure.

However, when the wing is parasoled on a stick model, the center of lateral area is raised well above the center of gravity so that the model, if it is extremely fast, will have a tendency to spiral dive. If the model is a slow ship, the high center of lateral area will not have very much detrimental effect. The effect builds up with the speed of the plane. So the conclusion is that if the ship is slow and sluggish, you may parasol your wing with safety.

In order to obtain the proper amount of parasol effect, the wing should be raised, in the average case, about 1/15 of the moment arm above the thrust line, if the stick model has a landing gear. The wing should seldom be parasoled more than an amount equal to 1/3 of the moment arm. This is about the maximum limit. It is possible to parasol the wing more than this but there will be no advantage in doing so. In exceedingly slow airplanes without a landing gear, the wing may be parasoled as much as 1/3 the moment arm above the thrust line. This helps stability to a considerable extent. However the fact that the thrust line is low in this type of model, below the center of gravity, detracts from the stability of the plane. The only way to overcome this is by using a tilted thrust line so that the thrust line continues rearward passing above the center

of gravity. The angle of the wing and tail in this case should be determined relative to the thrust line, *not the motor stick.*

In the case of fast models it is better to place the wing on a line with the line of thrust. That is, fasten the wing directly to the stick without a parasol effect, if the model is of the landing gear type. By doing this you have a considerable amount of pendulum effect and consequent lateral stability. Also, the center of lateral area will be close to the center of gravity which means that the model will not bank excessively on turns under high speed.

Question: Would positive stabilizer take out the stall at the beginning of a flight without having the model dive at the end of the flight?

Answer: Yes, this is the correct procedure, for under speed at the beginning of the flight the tail will be lifted slightly, tending to keep the nose of the model down. At the end of the flight under slow speed, the tail will have a tendency to drop slightly, allowing the model to glide gently.

C. R. Knox of Perth, Ontario, Canada, Box 416, has some questions which may be applied to large ships as well as models.

Question: Why are airfoil sections'

leading edges made blunt instead of rounded?

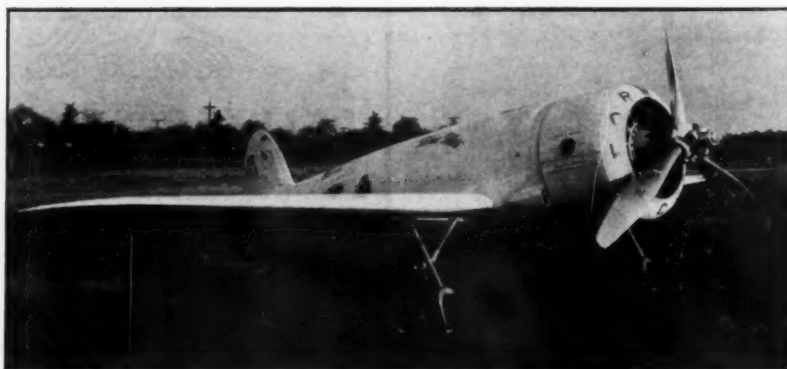
Answer: The blunt edge of an airfoil section retards a certain amount of the air which strikes it at the blunt nose. This air is allowed then to flow around the airfoil close to the upper and lower surfaces of the section. In this way the air stream is prevented from breaking away from the surface of the airfoil and insures lift at high angles of attack. In other words, the lift on such an airfoil will not drop off quickly but rather gradually.

The air flow around a pointed airfoil breaks suddenly at the stalling angle due to the lack of the air cushion which the rounded nose produces.

Question: What is the meaning of torque in connection with engine and propeller, and in relation to lateral stability of an airplane?

Answer: This question is a little ambiguous. However, we will answer what we think this young man means. The cause of propeller torque is due to the resistance which the propeller blades cause as they pass through the air. Every airfoil causes resistance, therefore the propeller blades cause resistance. This resistance, or pushing back, on the propeller blades tends to keep the propeller

(Continued on page 48)



Frank Hawks' new mystery speed ship, "Time Flies." It is said that its high speed is over 375 miles per hour. It lands at 68 m.p.h. and has a terminal velocity in a dive of 750 m.p.h. It is powered with a 1150 hp. Twin Wasp R-1830 B.G. Engine, released to Hawks by both the U.S. Army and Navy for this project. A feature is the retractable windshield, which drops down, making a smooth unobstructed surface on the top of the fuselage. The ship carries all of the latest flying instruments including a Sperry Gyro Compass and a Sperry Gyro Pilot. The rate of climb is 7000 ft. per minute at sea level. A gasoline capacity of 230 gallons gives the plane a range of 1700 miles.

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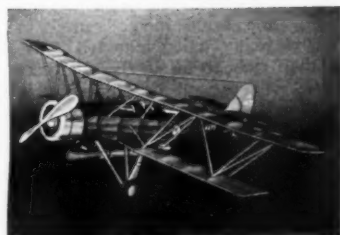


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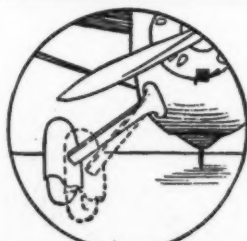
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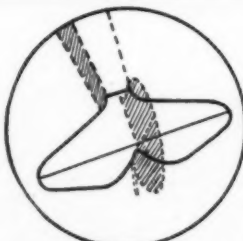
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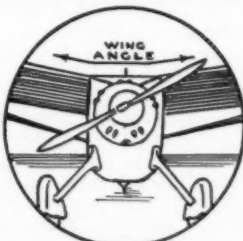
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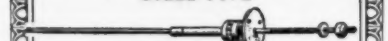
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How to Photograph Your Models

(Continued from page 7)

given and then after development you can more easily tell whether you need more or less time. A yellow color filter over the lens will bring out any clouds which happen to be in the sky and will add greatly to the general effect of your picture. An exposure of about two times the regular time will be needed with a Kodak or K1½ type filter.

As a further touch of realism, a miniature pilot is often helpful. However, if you do carve a pilot for the model, be sure to place him so that he will be natural-looking. That is, don't have him looking stiffly ahead from the cockpit but instead have him looking slightly to one side or even down into the cockpit a little.

After a few experiments at this fascinating hobby of model photography, you should be able to take model airplane photographs that will very closely resemble photos of large ships.

Building a Streamline Gas Model

(Continued from page 20)

ning from leading to trailing edge without overlapping. This protects the surface of the wing from rubbing on the wing mount.

Fuselage

As is apparent from the drawings, the fuselage is made in two sections, being split at bulkhead "P". The front portion will be constructed first.

The two engine bulkheads "A" and "B" are cut out first, using ¼" poplar plywood, three ply, for material. They are the same with the exception of fittings "A" and "E" which are present only on the front bulkhead. Be sure you get the spacing between these two bulkheads correct, since it is not apparent from the drawings. It is 2½" from center to center. Cut them out on a mechanical or hand jig-saw, taking great precautions to follow the outline without error. Before continuing with other bulkheads, shellac bulkheads "A" and "B". Two coats will be necessary. Fitting "B" should be cut from .020" brass, making eight of them. Attach to the bulkheads as shown. The other fittings should be attached after silking the fuselage.

Now cut the other fuselage bulkheads, "C" to "Z". ¼" poplar plywood, three ply, is the material. In making the templates for this job, it would be advisable to paste the drawings to some three-ply Bristol board. On the stock, lay off the center lines for the ellipses, again checking the angle between them for 90°. With a pair of scissors, cut the Bristol board to the outline of the first bulkhead. Lay the template on the stock, lining up with the center lines, and carefully trace the outline to the wood. Turn the template over and do this for the other side. Remember, discrepancies as small as 1/64" will give some trouble later on. Next cut away the template to the inner part of the outside bulk head, and again trace for both sides, giving us one complete bulkhead. Continue in this manner, until all the bulk-

heads are transferred directly to the stock, just in the same way they appear on the drawings.

Since there are no stringers in this construction, the first four planks that are applied will line up the bulkheads for the rest. Select four straight planks of regular size. Draw a center line with a straight edge on each of these planks, and mark off the bulkhead spacing which, except for the space between "A" and "B", is two inches. With the first 2½" space, the total fuselage length, from "A" to "P" is 30½".

At this point, equip yourself with an ordinary sewing thimble, so that the pins may be pushed into the plywood bulkheads easily. Attach the four stringers (planks) to bulkheads "A" to "H", then put in bulkheads "I" to "P"; all the time lining up the extreme ends of the minor and major axes of each ellipses with the center lines drawn on the planks. Make sure that all the bulkheads line up before applying cement to the joints.

Continue now with the planking, using the cement tube employed in the wing and tail construction. First place a plank to the right or left of one of the first four planks. Working clockwise or counter-clockwise, apply a plank next to the other three "king" planks. Then, working in the opposite direction, lay on four planks on the other side of the each of the first four planks. In this way, put on all the full-length planks possible, never allowing more than one extra on any one side of the fuselage.

If the plank will not go on the fuselage in its entire length without being tapered, employ the same method used in the wing planking, using long triangles from the plan ends to fill in the empty spaces. While working on the fuselage, it will be found convenient to shift pins from dried joints to newly cemented ones, as an economic and time-saving convenience.

Again try to allow this planking to dry as long as you can before sanding and silking. In sanding the fuselage, use the block with the rough sandpaper as before. Finish off with fine sandpaper.

Before silking, all holes in the fuselage skin should be cut. These are: 1¼" diam. circle for the battery box, located tangent to the rear of bulkhead "B" on the bottom of the fuselage; ½" diam. circle, also on the bottom line half-way between "A" and "B"; 2 opening holes for undercarriage struts, location and shape shown in the drawings; and two hatch holes, also described in the drawings.

Balsa props, placed inside the fuselage structure will hold its shape while the silk is being applied and doped. Do not neglect this as unimportant.

Silk the fuselage in the same manner as the wing and tail, with the seam on the bottom. It is not necessary to overlap this one piece of silk.

However, before the silk is put on, fitting "E" should be attached to the end of the fuselage. Shape three of the fittings as shown and cut off three pieces of ¼" x ¼" hard balsa, a trifle less than 2" long. These should fit between bulk-

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heads "O" and "P" at the places marked on the bulkheads. Cement these pieces as close as they possibly will go to the skin. Cut a trough about $\frac{1}{8}$ " deep through the skin and the short stiffeners, continuing it $\frac{1}{4}$ " forward of bulkhead "O". The squared hook of fitting "E" is then pushed through this end of the trough and pulled toward bulkhead "P", thus hooking it around "O". In position, only the smaller rounded hooks will project above the skin, since the trough which has been cut receives the rest. Cover any holes with small pieces of scrap balsa and cement all three fittings in place both inside and out.

After the silk has been applied, cover the following portions of the fuselage with $\frac{1}{2}$ " tape; silk seam all along the bottom of the fuselage; lining of the undercarriage holes folding over both inside and out; the forward end of the fuselage, over bulkhead "A"; and over

the switch hole, both inside and out. For the switch hole, place the tape right over the hole, and then cut away the tape to the edge.

Rear Part of the Fuselage.

The cross-hatched portions of bulkhead "V" to "Y" are to be cut away and discarded. "Z" should be cemented to the rear of the stabilizer and fin, centering it as accurately as possible over the intersection of the respective center lines of the tail surfaces. Mark on the stabilizer and fin the bulkhead spacing of 2", working forward from "Z". Bulkheads "V" to "Y" should be attached, in their remaining parts, to the tail surfaces by cutting holes in the skins and cementing the pieces separately. The dotted lines on these bulkheads show the depth to which the pieces are sunk into the skin.

Bulkheads "P" to "U" ("P" duplicate) should then be attached with pins to four

planks for lining up as in the front portion of the fuselage. The upper and two side planks are twelve inches long. The bottom plank is full length, 22". Again with pins, attach this plank to the bulkheads that have been cemented to the stabilizer. Because the stabilizer and fin are in the way, no more planks can be put on center lines. However, a plank parallel to the center line, touching the upper surface of the skin may be attached on each side. Also place two more in a similar position, touching the lower surface of the stabilizer. Also place two planks on either side of the fin, parallel to the plan center line. Line up everything thoroughly with the eyes and a straight edge before attempting planking.

Planking is done here with $\frac{1}{4}$ " x $\frac{1}{4}$ " planks. Proceed with the now familiar missing triangle method. Remove the $\frac{3}{8}$ " planks only from the top and bottom and replace with three $\frac{1}{8}$ " square planks.

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Sand as much as possible with the block and finish shaping between surfaces without the block. Before final sanding, fillet the surfaces into the fuselage with $\frac{3}{4}$ " x $\frac{1}{4}$ " planks of very soft wood. First bevel off the edges of the plank so that it assumes the form of a very flat triangle. This will fit nicely between the surface of the stabilizer or fin and the fuselage. Cement this in place, holding the front curved as much as possible with pins. It may be necessary to crack the strip near the front so that it will conform to the curve, but this will not matter. Trim off the end and give the plank a smooth flowing concavity with sandpaper.

Sand lightly and silk the rear portion of the fuselage. Do not put silk on the fillets. Tape the fillets, using two pieces for each, top and bottom, joined at the very front with no overlap. This should turn out to be the smoothest job on the whole ship.

Cut out a tail plug from the drawings given for this part. Merely cut the block to correct general size from soft balsa, cement to bulkhead "Z" and shape as shown when the joint has dried thoroughly. The discarded control surfaces from last month should now be fitted to the space provided for them. Cut their ends to fit the outline of the tail plug and cover them with silk. Give but one coat of dope and attach them to the fin and the stabilizer with doped tape. When applying the tape over the cracks, allow it to sag down somewhat, so that the surface will be free to move easily after the tape has dried. Finish dopping the surfaces while attached to the fin and the stabilizer.

Tape the front of this portion of the fuselage, folding the tape over so as to protect the face of bulkhead "P".

Fitting "E" should be attached to this portion of the fuselage in a similar manner as before, between "P" and "Q" on the markings given on the bulkheads.

With this, the two halves of the fuselage may be joined experimentally. Use about nine inches of $\frac{3}{16}$ " rubber wound tightly between the corresponding hooks on each portion of the fuselage. Unless you have been very accurate and somewhat lucky, the fuselage will not line up

very well. Correct this fault by placing small pieces of wood dowel on bulkhead "P" of the front portion of the fuselage, at the three points where the stiffener backs up the bulkheads. These stubs of dowel may be filed down to the smallest size that will give good alignment. Straight edges held against the surface of the fuselage at the joint will suffice in this alignment process as checks.

While this appears to be a tedious job, it should not take more than a half hour to attain perfect alignment.

The Evolution of Carrier Aviation

(Continued from page 5)

was put in operation. Another noteworthy accomplishment is the 100% safety record of emergency parachute jumps. Not one life has been lost due to malfunctioning of this important device since it was adopted by the Navy Department.

Flotation gear is carried on all of our naval airplanes. Carrier planes are not constructed so as to be seaworthy, as the necessary structure would lessen the speed and maneuverability of the aircraft. This flotation gear consists of large bags located within the plane's fuselage or wings and which can be quickly inflated with carbon dioxide gas from a highly charged flask included in the plane's equipment. These inflated bags will normally keep the aircraft afloat sufficiently long to insure rescue. Should the bags lose their buoyancy before the crew can be rescued, the men may take to a small collapsible rubber boat also included in every carrier plane's equipment. The boat is also inflated with carbon dioxide gas.

Present equipment on our carriers consists of the following types: VB-Bombing, VF-Fighting, VJ-General Utility, VO-Observation, VS-Scouting, VT-Torpedo. Other types recently added are the dual purpose bombing-fighters, scout-observers, scout-bombers and torpedo-bombers. The main force of the fighting squadrons is made up of Grumman F2F-1 and F3F-1 single-seaters and Curtiss BFC-2 and BF2C-1 bomber-fighters. A few Boeing F4B-3 and F4B-4s are also in use but are rapidly being replaced with newer and faster equipment. Dive bombers in use are almost wholly Martin BM-1s and BM-2s and Great Lakes BG-1s. General utility planes are now wholly Grumman JF-1 amphibians, although some Vought "Corsairs" are used in this category even though classed as observation ships. Scout-observation planes consist almost wholly of the new Curtiss SOC-1 biplanes, although some Vought O3U-3s are in use. Straight scouting types used are Voughts entirely, being of type SU-1, SU-2, SU-3 and SU-4. Vought SBU-1s comprise all of the present scout-bombers in use.

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Curtiss is now building 84 SBC-3 scout-bombers. The Northrop Corporation has won its first large naval order and is now making 54 BT-1 dive bombers. It is understood that these ships are in most respects like the A-17 Army attack ship but feature a fully retractable landing gear. Although long considered unfit for carrier use, the low-wing monoplane has now seemingly come to stay in this branch of our country's defense.

A Miniature Fairey "Battle"

(Continued from page 13)

cellophane and then glued on the body at the proper position. A little black paint will trim it up considerably.

Wing

Cut the wing ribs from 1/32" stock except for the end ribs, No. 7, which are cut from 1/16" material. The spar is tapered from 1/16" stock to the size shown on sheet 3. Round one edge of the 3/32" square leading edge and taper it slightly so as to fit the smaller ribs nicely. The triangular cross-sectioned trailing edge is cemented to the ribs and notched to receive the 1/32" square bamboo tip. Tilt ribs 7 a little to give the wing some dihedral. A smaller spar is cemented in ribs 6 and 7 for the landing gear attachment. Cover the wings with colored paper; the original model had orange wings, but practically any color will go with the silver fuselage. The bottom section where the landing gear fastens should be left uncovered so that the gear may be glued in later.

Landing Gear

Bend two "legs" from No. 15 wire but leave the upper part straight until you get ready to fasten them in the wing. Upon these slip some treated combric or spaghetti tubing; plain rubber tubing will do if necessary. And on this slip a 3/8" length of aluminum tubing to represent the large-sized shock absorber of the real plane. Take a pair of 1 1/4" balsa wheels and cut one disc out on each to the cross section shown on sheet 4; this will give enough room to conceal a hub. A small aluminum tube will serve well for a bushing. The aluminum disc to cover up the hub can be hammered out or pressed from a thin sheet. After this assembly is complete, cement each leg in place and finish covering the bottom of the wing. The wheel streamlines are bent from 1/64" sheet and cemented on the paper covering in back of a space left open (dummy) for the retractable wheel. A wire brace, W will serve to brace it securely and the ends of it should be pushed through the main spar.

Tail Surfaces and Assembly

The spar for the rudder is sliced from 1/16" x 3/8" material and cut the ribs to fit from 1/32" sheet. Make the leading edge from 1/16 x 3/32 balsa and round it so as to form a good leading edge. The tip and trailing edges are cut from 1/32" sheet. Make the tail in the same fashion and cover them with tissue. The fillets for both tail and rudder are carved out of soft wood to the shape shown and glued in place. The fin of the rudder should be silver and the military stripes are painted on using lacquer.



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Glue the tail and rudder in place and set aside to dry. Cement the wings on the stubs making sure that there is 1" dihedral in each tip.

Propellers

Carve a spinner $\frac{3}{4}$ " in diameter and notch it to receive three blades. Both a scale and flying scale prop blade plan are shown and should be cut and sanded from 1/16" sheet. Bend a shaft out of No. 15 music wire. A hardwood nose button serves well for a bearing; two brass washers or a ball-bearing washer will minimize friction between the spinner and bearing. Paint the blades and spinner with several coats of silver paint to look like metal. Four or six strands of $\frac{3}{8}$ " brown rubber will adequately power our rapid plane.

Details and Flying

Exhaust stacks should be painted black and glued on the nose of the "Battle." Insignia should either be pasted on or painted with lacquer in the places shown. A radio mast will enhance the appearance of our model as will also identification numbers. The tail wheel is either balsa or hardwood and held in place by an aluminum fork. Paint it black with silver discs. When the model is all assembled, glide it carefully over tall grass and add weight in front if it stalls or bend up the elevators if it dives. When all adjusted, a four strand motor if stretched will take 1200 turns with a winder, of course, and a six strand motor 960 turns. If the model is rather heavy, eight strands may be necessary and this motor will take 825 turns. The finished model should weigh around 1.4 oz. and the average duration runs around 60 seconds. Good luck!

Bill of Materials

- 1—1/16" x 2 x 24" sheet balsa
- 1—1/32" x 2 x 24" sheet balsa
- 3—1/64 x 2 x 24" sheet balsa
- 2— $\frac{7}{8}$ x $1\frac{3}{4}$ x $1\frac{3}{8}$ balsa blocks
- 1— $\frac{3}{4}$ x $1\frac{3}{8}$ square balsa block
- 2— $\frac{5}{8}$ x $\frac{3}{8}$ x $1\frac{1}{4}$ balsa blocks
- 2—sheets tissue
- 1—oz. cement
- 1—oz. wood filler
- 1—oz. clear lacquer
- 2—oz. banana oil
- 8—feet brown rubber
- 1—1/16 x $\frac{1}{4}$ bamboo
- 1—foot No. 15 music wire
- 1—oz. silver paint
- 3—cans lacquer, red, white and blue
- 2—wheels $1\frac{1}{4}$ " diam.
- 6—washers
- cellophane
- spaghetti tubing and aluminum tubing
- sheet aluminum

Designing Your Models For Speed (Continued from page 17)

in the speed plane given in previous pages as a basis. The correct areas may be calculated by substituting these values in the formula for (M) and (N) respectively.

Approximately the fin and stabilizer areas should be about 10% more when a nose-tail tandem propeller system is used than in normal single propeller jobs. In this event the example model should have a fin area of (6.38+0.64) sq. in. or (7.02) sq. inches, and a stabilizer area of (18+1.8) sq. in. or 19.8 square inches.

The general design of this tandem type will have to be changed slightly also, for the tail propeller must have proper ground clearance. Therefore the tail will have to be raised above the ground enough to create a distance from the thrust line to the ground of ($\frac{1}{2}$) the propeller diameter plus one half inch. In this case it should be $4\frac{1}{2}$ inches.

This condition requires the use of a long tail skid of some sort. A convenient way to create the desired result is to locate a large part of the fin below the fuselage and have the tail skid extend down from its lower tip. This is illustrated in Fig. No. 124.

By doing this the center of lateral area of the model is certain to be on a line with or below the C.G. This will insure spiral stability. If the C.L.A. should happen to be too low in this case, the top of the fuselage should be raised in order to insure more vertical side area above the C.G., and thereby raise the C.L.A. to its proper location. However if the designer fails to consider this point little harm would result, as it is better to have the C.L.A. too low than too high.

Twin Propeller Pusher Speed Models

The twin pusher type of model is probably familiar to most readers and is one of the best types for a speed model because of the powerful motors that it can carry. The twin propeller arrangement also eliminates propeller torque effect and is therefore the best type also to insure a perfectly straight flight. It is illustrated in Fig. No. 125. Briefly it is composed of a "V" frame with two propellers mounted at the wide, rear end. Across this frame two wings are imposed; a large one at the rear and a small one at the forward end of the frame.

The only thing which makes one model differ in its type of performance from another, as far as design is concerned, is the relative proportion of the various parts. The quality of its performance depends upon aerodynamic efficiency and stability qualities.

Therefore in order to ascertain that our model will be primarily a speed model, let us see what characteristics of propor-

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1/8x119 1/2... 2 for .25
1/8x11

tion it should have. First of all, in order to have high speed, it must have plenty of power. Second, the propellers must be of medium or medium high pitch relative to their diameters. In order to insure such a pitch the diameters should be as large as possible. Third, the wings should be very small. In order to insure high propeller pitch the model should not be too small. A frame 33 to 36 inches long and a wing span of 20 inches is a convenient size.

Due to the fact that great power may be installed compared to the total weight of the plane, very little wing area is necessary. Inasmuch as the span of the large rear wing should not be much less than 30% of the length of the frame, a small wing area will induce the use of a small chord and a high efficient aspect ratio will result. The chord should not be so small however that the wing will be too thin and weak to withstand the high speed of the plane. An aspect of ten should be the limit for speed models. If the chord is made 2.25 inches, the aspect ratio will be 8.8, which will be excellent.

The airfoil section should be similar to the one shown on page No. 23, January issue. The camber should be about 1/16 the chord, never more than 1/12 the chord, and the under surface should be rounded down slightly. The amount of dihedral required will be determined later when stability requirements are determined. To insure efficiency and high speed the rear wing should have a small angle of incidence or no incidence at all. A large angle of incidence on the rear wing will necessitate an excessively large angle of incidence on the front wing which will cause it to be inefficient. Spinning will result from such a condition.

Front Wing

For the sake of efficiency and high speed the front plane or elevator plane should be small. If it is too small it will have to have a very large angle of incidence and induce high resistance. Experience has shown that the span of this surface should be about 35% of the rear wing span. It should be then 7 inches, not including the dihedral angle. A chord of two inches would be satisfactory and the airfoil section may be the same as that used on the rear wing.

The angle of incidence should be about 3 degrees greater than the angle of incidence of the rear plane. The latter is to have an incidence of zero degrees, therefore the front plane should be set at a *three degree* positive incidence angle. The tips of both wings should be well rounded. As stated in previous pages, the elliptical shaped wing tip is very efficient. Shaping the tips in this way reduces the drag of the wings and increases their efficiency.

Propellers

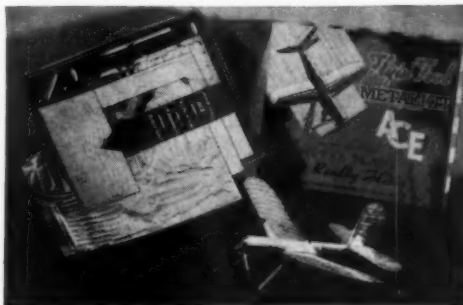
The diameter of each propeller on this type of plane should be not greater than 40% of the wing span. They may be smaller but the larger the propeller the greater is its capacity for delivering power efficiently. In this case therefore a diameter of eight inches will prove very effective.

The pitch should not be less than 1 1/2 times the diameter. In pusher types the propeller pitch may be greater as the torque of the propellers is balanced because the propellers turn in opposite directions. There-

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fore a pitch of about 14.5 inches will be selected as the model will travel faster with any given number of revolutions per minute. This pitch requires that the propeller should be cut from a block, the proportion of which is, as 7/8" is to 1 1/2", when the diameter is eight inches. Now in order to determine the exact dimensions of the block the required blade area must be determined.

The blade area must be a certain percentage of the total wing area for any propeller pitch and desired quality of performance. In the cases of speed planes an extremely large blade area, relative to the wing area, must be used to transmit the power efficiently. Also as the propellers have a fairly high pitch, more blade area will be required than in the case of ordinary models. By examining the propeller tables given on pages No. 35 and No. 36, October, 1932, issue of MODEL AIRPLANE NEWS, you will see that for a pitch of 14.5 inches and

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an extreme rate of climb (or performance), a blade area equal to about 24% of the wing area should be used.

The wing area of a pusher is determined by adding two times the area of the front wing to the area of the rear wing. The area of the front wing is doubled because the resistance is doubled by the large angle of incidence used, compared to the rear wing, per square inch of area. The aerodynamic wing area of this twin pusher is then $(44 + 2(12))$ or 68 sq. inches.

The propeller blade area therefore should total about 17 sq. inches. In the blade area tables it is shown that a propeller cut from a block $(8" \times \frac{7}{8}" \times 1\frac{1}{2}"$), will have an area of 8.38 sq. in. and a pitch of 14.6 sq. in. As there will be two propellers on the model the total blade area would be 16.76 sq. in. for these propellers. This is about the required amount and will be suitable for our high performance plane.

The center portions of the propellers need not be cut away, but well rounded tips will contribute to efficiency. The propellers should be mounted on strong ball bearings.

Now we have to consider the strength of the motors. The designer should figure to use about 22 strands of $\frac{1}{8}"$ flat rubber in each motor, or 16 strands of $\frac{3}{16}"$ flat rubber. It is desirable to use as much rubber as possible, however the ability to wind rubber motors and the fact that they must have a capacity for sufficient turns to fly a specific distance, limits the number of strands that can be used.

Frame

The frame is to be 33 inches in length. The simplest construction to use is the "V" type, composed of two heavy stringers, strong enough to withstand the torque and tension of the powerful motors: Hard wood is advisable. In order to reduce the resistance to a minimum they should be streamlined, their height being about $\frac{1}{2}$ their width. Cross bracing should be used to insure complete rigidity.

Stability

The next problem is to make the model stable. Longitudinal stability is taken care of sufficiently by the longitudinal dihedral of (3) degrees. (Front wing 3°, rear wing 0°). It remains to endow the ship with lateral and directional stability. This is the point at which the average speed model designer goes "hay wire," if we are to judge from ships seen at speed contests. In a speed model these two types of stability are linked together and are inseparable. Usually if one is present the other type is present also, but neither will characterize a speed model of the twin pusher type if the front wing is straight without being dihedralized. If many builders have wondered how to make their twin pusher speed jobs fly straight, this is how to do it.

First make the rear wing without any dihedral. Second, make the front wing with a very large dihedral. Each half wing of the front plane should be given a dihedral angle of 35 degrees or each wing tip of this plane should be raised $1\frac{3}{4}$ inches. Speed planes with wings of this type, designed by the author, have made flight after flight as straight as a bee line from start to finish.

The answer to this may be obvious to many. When the plane banks slightly the nose does not drop and a turn does not take

place. The rear of the model slides slightly toward the low side while the dihedral holds the nose up and on its course. Try this on your next speed plane.

The mysteries of distance models will be uncovered in the next instalment. Until then, Happy Landings!

Navi-Goid

(Continued from page 11)

There was no answer from the quiet form at his side and he turned and found Roger Hayes staring at the dark silhouette of the superstructure that loomed so mightily over their heads.

"What's the trouble?" he drawled, humorously. "Picking a soft spot in the masts to crash?"

Lieutenant Hayes chuckled. "The trouble is," he replied, "that I can't find any soft spots. I've often heard that the *Saratoga* was a riveted mass of steel plates and it seems to be true. No, there doesn't seem to be any soft spots overlooked.

Jordan opened the flight room door and Hayes led the way in. They dropped their conversation as they entered the long room which, despite the presence of some seventy-five flight-gear pilots, was marked by absolute silence.

They found seats and settled comfortably, scanning the faces of the assembled pilots, acknowledging a wink here and a grin there. Three days aboard and they had grown to know quite a large number of shipmates.

The flight officer entered and made his way to the lecture stand. Eyes centered on his face as he confronted them.

"Flight instructions," he began. "All combat ships must take off, sustain flight for the specified time and then land. This is a technical problem, thoroughly discussed in your training in carrier navigation. At midnight, you will take off in combat formation, climb to five thousand, then break formation. Flight A must proceed north for one hour, individual flight, then return to the carrier. Flight B will proceed east for ninety minutes, then return. Flight C will proceed west for two hours and thirty minutes, then return. Flight D will proceed south for three hours, then return. Your speed and direction, other than the given compass quarter, is entirely your option.

"There is a governing compass variation of 18 degrees westerly. The wind speed is twenty-eight m.p.h. blowing northeast.

"At the specified time, you will determine the position of the carrier, and bank and return.

"The *Saratoga* will proceed on its present course, which is 260°, at its present speed of 32 knots (36.87 statute m.p.h.) for two hours and thirty minutes. It will then lay to and await your return. Our present position is 1.30° S Latitude 121.15° W Longitude.

"This maneuver will be executed under the emergency conditions of war which

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means that there must be no illumination aboard the carrier and no radio communication between the planes and the carrier. The two stern red landing lights, of course, will be maintained.

"Seven o'clock in the morning will be zero hour. After that time, those of you who may have become lost, may radio and we will give you a direction beam. That is all."

The flight commander hurried from the room. The pilots rose and filed from the room, with the rising murmur of their voices betraying their excitement.

The flying deck was crowded with the combat ships of the four flights. Figures were hurrying about, mingling with the dark shapes of the pilots, but characterized by the odd colors of their helmets, white marking the crew chiefs, red for the firemen, yellow for the taxi crew, blue for the repairmen and green for the arrestor-gear crew.

Starters were whining their ghostly cries. Motors fired with sharp, staccato barks.

Lieutenant Hayes slapped Jordan's shoulder roughly. "See you when we sit down in the morning. So long," he said.

"Best of luck," Jordan called after him, "... and stay out of the riggin' when you sit it down."

He threaded his way through the massed planes until he came to his own Boeing. His mechanic looked up and nodded, then climbed from the cockpit. Jordan climbed the toe-plates and slid his bulky form into the narrow pit.

Motors blasted. Slipstream whipped and tugged at Jordan's moored Boeing. "A" flight was taking off.

He glanced at his clock on the dimly illuminated dash panel. Midnight.

The thunder of the motors of "A" flight was lessening. There was a second lantern flash and "B" flight lunged, one by one, into

the void beyond the edge of the flying deck.

His eyes again sought his dash panel. Tachometer climbing. Oil pressure steady. Chart in position. Computation instruments in their proper brackets. Fine! He snapped off the dashlight.

Flight "C" was racing down the deck. Hayes was in "C", which was soon marked by mere crimson exhausts in the darkness.

Two mechanics flanked the Boeing's wings. Beyond were other combat ships. Ships of flight "D", his flight. Their motors, drumming in savage harmony. The lantern flashed. The mechanics released Jordan's ship and he slapped the throttle wide open. The roar thundered on his eardrums.

The flight leader was racing forward.

Jordan's Boeing blasted its tail high off the deck. Then it was rolling on the flat apron of steel, fighting for speed and lift. The brief runway of the deck vanished all too soon beneath the Boeing's wheels and Jordan felt the biplane founder. He edged the stick forward. The motor sobbed. Spray fell on his face in fine mists.

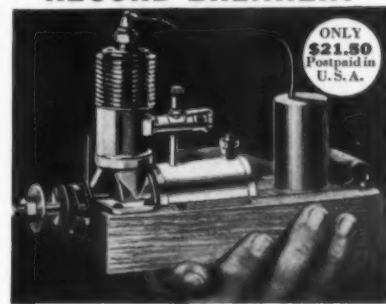
Then the Boeing was fighting its way aloft and Jordan gave a relieved sigh. Ahead, the exhaust flames of the flight leader glowed, ... circling. Jordan touched his rudder and his ailerons and followed.

Below, the black surface revealed the greenish, phosphorescent wake of the carrier. The encompassing seas and horizons were blended in an opaque infinity. And above, very distant, the stars winked and watched.

Jordan switched on his dashlight. Altitude 4.8. He eased the rate of climb until the meter registered 5.0, then ruddered about until his gyro compass swung beyond south.

His clock read 12:10. He noted it carefully on his chart-pad. The altimeter ode at 5.0 and the compass at 280. He eased

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2. Official Entry Blank must be filled out and mailed.
3. Contestants may incorporate as much detail as desired.
4. Preliminary judging will be from photographs submitted by contestants. Such photographs will not be returned. Name and address of contestants must be shown on back of photograph. The judges will select 100 models from these photographs, which in their opinion attain highest ratings. The 100 selected will be asked to send their models to Schenectady, N. Y., for final judging. Models must not be sent until requested.
5. Contest opened Nov. 1, 1936, and closes August 1, 1937.
6. Prizes will be awarded on a basis of general accuracy, detail and quality of workmanship.
7. Models which are awarded 1st to 6th prizes inclusive are to be and become the property of Mohawk Model Planes & Supplies. All other models will be returned to contestants.
8. Judges to be selected by the Mohawk Model Planes & Supplies. Decision of the judges as to all matters is to be final.

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the gun until the airspeed indicator needle receded to 90 m.p.h. Then he adjusted the directional gyro to zero.

His flight leader was gone. No glow of exhausts greeted his searching eyes. At five thousand, the flight had broken formation.

He kept his dash illuminated and checked his instruments constantly. This flight was an important and rigid inspection of carrier tactics. The difference between "accurate in carrier night problem" and "errors in carrier night problem" in the combat progress report meant a lot. So he flew with his eyes glued to the instrument board, maintaining a five thousand altitude, a gyro zero course and tensely held the turn and bank indicators in balance lest he slip from his plotted course.

Time dragged at his nerves until he felt the weariness of fatigue. The cool, night air washed his face and penetrated deep into his lungs as he breathed.

It was heaven. Free. His fingers guided the valiant ship that was his steed. Like some nocturnal creature, he winged his way across the black sky.

* * * * *

0230 Naval Time. 2:30 A.M.

Jordan studied his chart until he found the carrier's position when he had taken off. From that position, he plotted her course until she hove to at the specified time interval of two hours and thirty minutes.

He measured his distances carefully, then placed a dot at the point. At the third hour of his flight, he had to bank and return to that point and land successfully. If he did that, he was a tested naval pilot. If he missed? Well, they might give him another chance . . . although they didn't like taking chances of his missing connections and crashing a fifteen thousand dollar plane.

Forty minutes yet before turning about.

He eased his head against the crash pad. No tell-tale glow of foreign exhausts had disturbed the darkness since "B" flight had broken formation. Apparently he had selected a course for a lone vigil.

Well, at least there would be nothing to disturb him from his arrow-like course. 0246.

He concentrated on his chart panel and, with little difficulty, found his theoretically true course on the chart. This course, he projected to 0310 which would be his position when the three hour period terminated. Knowing the Mercator position of the plane at 0310 and the position of the *Saratoga* at the same time, he drew a line from one to the other. This line was his true course which he must use to return.

He was glad, noting the ease and simplicity of the calculations, that he had followed a certain course at a certain speed the whole trip. It assured the accuracy of his position.

0310.

Time to return. He was grinning confidently as he touched rudder and aileron until he was once more winging his way back to the carrier.

* * * * *

There you are, cadets! You must answer the question: at what compass bearing did Lt. Jordan fly to return to the *Saratoga*?

Remember to allow for the variation at all times when translating the true bearing to the magnetic compass bearing and when translating the magnetic compass bearing to the true bearing.

Mail your answer with the map to: NAVI-GOID CONTEST JUDGE, MODEL AIRPLANE NEWS, 551 FIFTH AVENUE, NEW YORK CITY.

NAVI-NOTES:

Naval time, numerically simplified for ease of transmission, is given in four numerals; i.e., 0245 . . . which means 2:45 A.M. 1030 would be 10:30 A.M., etc.

Frontiers Of Aviation

(Continued from page 9)

also have out a new cabin job.

Now that interest has once more been stirred up for stratosphere flying resulting from the English Bristol monoplane breaking the world altitude record, this writer calls your attention to the new Farman 1002 stratosphere plane. It should be able to break the existing record and bring the title to France! It is powered by a 540 hp. engine and is a successor of the Farman 1001 which crashed last year after reaching a height of 32,000 feet.

Harry Crosby last month completed improvements on his all-metal racer. It had a new enclosure which covered the cockpit neatly. Fairings were attached to the landing gear which would cover them when retracted. A wooden prop was also put on the little ship, and it was all ready for the Miami races. After completion Harry took it up for a test flight and was well satisfied with the way it performed. He had contemplated putting a small radio in the ship so he could keep track of the number of laps flown when in a race and had also experimented with dry ice for cooling the engine oil. These two features were not incorporated in the plane however for one reason or another.

A few days after the test flight Crosby took his swift ship up to fly it over a measured course in order to break the existing speed record for that type of plane. He was seen to fly past the course once and then disappeared. After an extensive search his plane was soon found an hour later in a ditch very badly damaged. Harry was taken to a hospital, and fortunately he will recover. Engine trouble was the cause of his crash. The plane was completely wrecked.

DeHavilland's new twelve-cylinder Gipsy engine has 400 hp. and will be used on the new four-engined low-wing D.H.

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transport. The DeHavilland Company is also working on a new low-wing training airplane.

In Italy many new airplanes are making their appearance. However, in spite of their large size most of them are still being built of wood covered with plywood instead of the all-metal skin-stressed construction. There is one exception however, a new single-engined low-wing pursuit plane of exceptional performance, but with the usual foreign appearance (all its "lines" seemingly in the wrong place). The pilot sits up almost twice as high on the fuselage as one does in the new Seversky pursuit. Of course the pilot has exceedingly good vision but it makes the plane appear top-heavy. The swift fighter is known as the Fiat G-50 powered by a Fiat 850 hp. two-row radial engine. Specifications of the plane follow:

Span—35.2 ft.
Wing Area—193.7 sq. ft.
Empty weight—3,530 pounds.
Gross weight—4,940 pounds.
Wing loading 25.5 pounds per sq. ft.
Top speed—285 m.p.h. at 13,120 ft.
Landing speed—70 m.p.h. (Flaps)
Service ceiling—34,120 ft.
The landing gear is retractable.

Another new Italian airplane is a twin-engined light bomber and trainer known as the Ghibli. Two 200 hp. Alfa in-line engines pull the ship at 158 m.p.h. It has very sleek lines, the fuselage having a long pointed nose projecting many feet in front of the wing. Another similar ship is the Libicio which has two 375 hp. radial engines.

Italy's latest mid-wing bomber is the Piaggio P. 32 powered by two Isotta Fraschini 820 hp. in-line engines. The plane is of the same general design and size as the Lockheed Electra. A large fuselage nose is enclosed in glass to house the bomber. Top speed is 248 m.p.h.

The Cant. Z 1011, designed by the Italian designer Zappata, is another new twin-engined bomber powered by two 820 hp. Asso. engines. Top speed is 223 m.p.h.

Sh-h-h. Don't look now, but the army

is taking delivery of a special Lockheed stratosphere plane. Lockheed's new 14-passenger transport for 1937 will have a top speed of almost 260 m.p.h!

Pratt & Whitney is coming forth with an engine of about 1,260 hp. while Wright is running in close competition with one of 1,220 hp.

Timm is finishing the fuselage of their new transport.

Because of the limited space we are unable to give the details of the recent Paris airplane show. A full account is promised in the next issue together with some interesting news on entries in the New York-Paris race. We will not fail to tell you about Koolhoven's 325 m.p.h. pursuit plane! The Paris show this year was the greatest ever held and displayed some wonderful new planes. Those of the Russians, Dutch and French were most outstanding and showed that the foreign designers were paying close attention to our methods of design.

How to Build a Scale Model of the North American Observation Plane

If you wish to square off the accompanying plans, making it easier for measuring, join the corresponding dots on the border with straight lines. Each square will equal one square foot.

Make the entire model from balsa wood which may be purchased at almost any model shop or large department store. It is best to purchase the wheels already made.

Make the fuselage first. Draw the top view on stock with the grain of the wood running lengthwise. Then cut around the outline with a saw. Then draw on the side elevation and shave down the sides. Round off the corners as shown by cross-sections. Go over the entire fuselage with coarse and then fine sandpaper until smoothness is obtained.

The wing and tail group are made in the same manner. Draw the outlines of the parts and then cut. Shave down the wing in cross-section as shown. A razor blade and chisel are best to use for this process. Sandpaper all parts thoroughly.

The propeller hub may be whittled from a piece of balsa with your razor blade and cement three blades to it cut from sheet balsa. A straight pin may be inserted through center as a shaft.

The next step is to assemble the model. Lay the fuselage in flying position on a level surface. Then, applying plenty of model cement, join the two wing panels in place to the sides of the fuselage. Put blocks under the wing to hold it in place. Join the tail surfaces in the same manner. Be very accurate. Then raise the model on blocks as it would be if resting on its landing gear. Cut out the various struts and fairings as shown on plans with your razor blade. Join these parts together and to the under side of the wing simultaneously with plenty of model cement. Use a small straight pin or wire inserted into the landing gear struts as an axle for the wheels.

Shape out some antenna posts and cement to the top of the model as shown and use black thread as the antenna. After the thread is connected and the con-

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14 min. in 25 m.p.h. head wind and freezing weather



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3/16x1/2 10c	1/4x1/4 4 for 25c	1/4" dia. 25c
3/16x1 15c	3/16 sq. 5 for 25c	Hard Aluminum
1/4 sq. 8c	1/4x1/4 4 for 25c	1/32x31 15c
1/4x1/4 12c	1/4x1/4 4 for 25c	1/16x31 25c
1/4x1/4 17c	3/32x3/32 10c	
Small Panels	3/32x3/32 10c	
3/16x3/16 12c	3/32x3/32 10c	
1/4x3/16 15c	3/32x3/32 10c	
Gas Model Cement	Pint	65c
Gas Model Balsa	Quart	\$1.10
1/4x1/4 2 for 5c	Colored Dope	50c
1/4x1/4 3 for 25c	(All colors)	70c
3/16 sq. 5 for 25c	Bamboo Paper	24"x36" sheet
3/16x1/2 10c	Per sheet	5c
3/16x1 15c	Dural Angle	1/4x1/4 per ft. 15c
1/4 sq. 8c	1/4x1/4 per ft. 25c	Turnbuckles
1/4x1/4 12c	3/4" take up 30c	
1/4x1/4 17c	Clear Dope	65c/Each
	Pint	

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nections have dried thoroughly, wet the thread. It will become loose for a while, and then it will tighten as it dries. Go over the entire model once more with fine sandpaper. Brush off all dust and then begin the paint job.

The fuselage should be painted blue, the windows above and below the wing, white; the wing and tail units yellow; the propeller silver. The vertical band on the rudder should be a dark blue and the other stripes red and white alternately. On the wing the background of the insignia should be blue, the star white and the circle in the middle red. All other trimmings are to be black. Apply many coats to the model in order to get a smooth finish. It is important that a good paint job is accomplished. When completed you will have a model of the fastest and most modern observation plane in the U.S. Army Air Corps.

Air Ways Here and There

(Continued from page 28)

In the photograph even the complete details of the tail skids and the fittings at the nose of the struts show up. The only possible defect was that the rivets which hold the cockpit cowl in place appear to be large in proportion to the rivets that would be used on a full scale airplane. The Doering brothers receive our congratulations.

Another fine job is shown in picture No. 2. It is a Lockheed Electra built by Richard P. Anderson of 122 Emery Street, Portland, Maine. Mr. Anderson says it is equipped with electric lights with the batteries concealed in the fuselage and controlled with a switch on the side of the model. The usual instruments are present. A dummy pilot has been cut from balsa and painted in life-like colors. The motors are all carefully built up. Other details are numerous; even the antenna is a finely braided copper wire.

One of the most unusual speed jobs that we have seen is shown in picture No. 3. Every line of the model seems to "ooze" speed. It was built by Paul Gustafson of 290 East 17th Avenue, Columbus, Ohio. We note with interest that the center of lateral area of this model is kept well down by the use of a single streamlined fin at the end of which a single wheel is fastened. Such an arrangement allows the thrust line to fall more nearly to the center line of the fuselage and the wings to be dihedral to a larger extent than usual. Mr. Gustafson calls it the "Sphinx Moth." The picture was taken by George Ginn who deserves credit for a fine photograph. The model flies well with a motor of from six to fifteen loops of 1/8" rubber. On twelve loops it has travelled fifty-four miles per hour over an eighty-eight foot course. Mr. Gustafson says that its maximum speed is well over sixty miles per hour.

Three interesting models are shown in picture No. 4, which were built by William Kreczek of 110 Manhattan Avenue, New York City. At the right is a very neatly made Pou du Ciel. The other two planes are of Mr. Kreczek's design. Mr. Kreczek has given us a fine illustration of structural work.

For those who are interested in posed pictures, take a look at No. 5. Mr. Ralph Collmann of Ireton, Iowa, is responsible for it. Anyone would be convinced that this was a real ship passing over some farm in the middle west. It is an eighteen inch model of an Aeronca low-wing and it is suspended by threads and a string in a very realistic manner. It is not easy to make realistic photographs of this type. Usually there is some fault which gives it away. This one we would say is perfect.

MODEL NEWS FROM OTHER COUNTRIES

Japan

Mr. Moriichi Kitamura of 5, 1-Chome, Kobikicho, Kyobashi, Tokyo, Japan, sends us picture No. 6 which shows the inside of his model factory. Mr. Kitamura may be seen busily assembling a model, while his helper, Miss Satoko Mikani, is going through the operation of covering a wing. The model shown in the picture indicates the careful workmanship which is always characteristic of Japanese-made models.

Mr. Kitamura, as readers of past issues know, is one of the prominent leaders of model building and model building clubs in Japan.

England

Now we jump to the other side of the world. Here we see Mr. W. Rigby of 45 Valleyfield Road, Streatham, S.W. 16, England, in picture No. 7, busily engaged in assembling a paper model of his design. Mr. Rigby is noted the world over for the design of paper models. These ships are even more realistic in appearance than models of other types of construction. Readers will note with interest the difference in size between the large model on the table and the small model close by. The small model actually flies.

Cuba

We hear from Mr. Arturo Espinosa Jr. of San Miguel 83, Altos, Habana, Cuba. It is not often that we hear from model builders in this country, but Mr. Espinosa tells us that the first two model contests have just been held in Cuba. There were eleven models present but none of them passed the twenty second mark. He says:

"The models were rather crude and heavy, built to withstand the strong winds that sweep this island during most of the days of the year. However, the contest was a success, this being the first time that most of the spectators saw models in flight."

"Another contest was held on the sixth of December and in this one there were twenty-two entries. Some models flew as long as one minute. At the time the wind was blowing twenty miles an hour over the Columbia Military Aerodrome, the place where the contest was held. A great improvement in the models was noted over those entered in the first two contests."

Mr. Espinosa tells us that enthusiasm is growing and he believes model activities will reach a high peak in 1937.

Italy

For the first time we have pictures of model builders and their airplanes from Italy. Italy has been saying little but do-

ing much. The young men in the picture, No. 8, are members of the Aero Club of Modena and are the team contest winners in the national model contest which was held there recently. In the right hand corner of the picture readers will see an Italian gas model. Various other types of models appear, including a six-foot glider, in the center of the picture.

CLUB NEWS

Utica, New York

We hear from Anthony Bally of 629 Pleasant Street, Utica, New York, who sends us picture No. 9, showing a hydro which was built from an R. O. G. commercial. The usual pontoon arrangement has been replaced with a single large pontoon in front and two small ones to the rear. This gives it the appearance of a huge Jersey mosquito carrying a fish in its talons. Nevertheless looks are not everything, for the model flies consistently 1½ minutes, rising from the water. It has 150 square inches of wing area and is powered with eight strands of brown rubber. Mr. Bally is a member of the Utica Model Airplane Club, which meets every Monday and Friday evenings at the local Y. M. C. A. building. Up to the present time, the best flight has been made by Bob Hamfeldt with a time of over fifteen minutes. Mr. Ray Darling, Sr., is the director of the club which boasts of thirty members.

Chicago, Illinois

We hear from Richard Obarski, secretary of the Chicago Aeronuts of 1733 East 86th Street, Chicago, Illinois. We writes: "By virtue of our last contest three N. A. A. records were broken in the helicopter event. Open records, Carl Goldberg, with 2:46.2. Alex Nekimken Junior record with 2 min. 7 sec. Dean Decker, Senior record with 1:49.8. These latest records bring the Aeronuts' total of indoor records up to fifteen.

"The following officers were elected for 1937: Carl Goldberg, president; Joseph Matulis, vice president; Richard Obarski, secretary; Marvin Setzke, treasurer; and Tom Cunningham, editor.

"To promote the general interest and competition the Aeronuts have introduced a point system. Points are given for placing in contests, attendance at meetings, experimentation and the like. The results of the past year are:

- | | |
|--------------------------|-----|
| 1. Richard Obarski | 86½ |
| 2. Wallace Simmers | 73 |
| 3. Charles Belsky | 60 |
| 4. Alex Nekimken | 57 |
| 5. Carl Goldberg | 56¾ |

Hartford, Connecticut

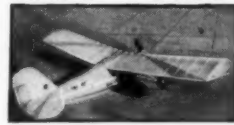
A new club has been started in Hartford, Conn., called the Model Aero Engineers of Hartford. Mr. Alfred W. Schmidt of 29 Vernon Street is chairman of the advisory committee. We wonder why they do not call themselves "the mushrooms," for the club was only started in September, 1936, with a membership of eight. Now it boasts of the large total of eighty-five and is still growing. Mr. Schmidt says that this is the largest model airplane group in the city of Hartford and one of the largest in the state.

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NOTE: Special Cowl as shown (not in kit)—Extra \$1.50.

The Scout was designed to give real performance to the smaller engines, such as Cyclone, Tom Thumb, Rossi, Mighty Midget, etc. Easy to build, fast climb, real flights, none of the saggy, wavering flights of a under-powered model. Four ships are shown on the plans; 48, 54, and 60 inch high wings, and a 60 inch low wing that flies. Any one may be built from the kit. Kit contains plenty of extra hard balsa, gas model cement and dope, music wire, motor mounts, aluminum sheet, bolts, nuts, switch, hook-up wire, full sized plans, silk and air wheels

\$7.25 Prepaid in U.S.A. Same kit with Whitfield's bamboo paper and rubber "do nut" wheels **\$4.85** prepaid in U.S.A.

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Cyclone and Ohlsson engine and parts, Ohlsson wheels, cowl, propellers, AC plugs, silk, bamboo paper, special batteries, pinked tape, straight wire, aluminum tube and sheet, 3½ inch air wheels, \$1.25, etc., a complete line of gas and rubber model supplies. Write for FREE circular. Shipments made same day order received.

DEALERS: Liberal Discount on Engines, Kits and Supplies. Use Letterhead for New Wholesale List.

A recent contest showed first, second, fourth place winners and 80 per cent of entrants built their ships with supplies from

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Boston, Massachusetts

The Jordan Marsh-Boston Traveler Junior Aviation League as usual is "hitting the high spots" with their models. Mr. Albert Lewis of this organization sends us the following news:

"Old records fell by the wayside when Jordan Marsh-Boston Traveler Junior Aviation League members flew in their first monthly contest of the new year, Saturday, January 2, in the Irvington Street Armory, Boston, Mass.

"Junior contestants took top honors as they set three new Boston model aeronautical marks. A senior flyer established a new local record. Every entrant in the J. A. L. meet turned in a performance beyond expectation despite adverse flying conditions.

St. Louis, Missouri

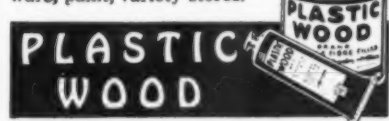
Mr. R. E. Podolsky, president of the Mid West Gas Model Engineers of 5406 Gravois Avenue, St. Louis, Missouri, has a very important question. We are wondering how this happened into "Air Ways" but nevertheless here it is and it pertains to the national championships, which we are sure, readers are anxious to hear about. Mr. Podolsky writes that we ought to do

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something to change the date of the National Contest from the end of June and first of July to sometime in August. He feels that due to the excitement of closing school and examinations that model builders cannot do justice to themselves and to their ships in the National Contest held during this period.

Your editor thoroughly agrees with this and we hope that readers will write to us if they wish to have the National Contest held later in the summer; for instance, during the month of August. If the contest takes place then the model builders would have plenty of time to recuperate from their school work and to prepare efficient models for contest performances. If we have enough builders to agree with this procedure it is possible that the date of the contest may be postponed.

This club is another unit of the Air Ways Club, which has recently been formed.

NOTICE

Mr. Irving Hoyser of 134 East Genesee Street, Syracuse, New York, sends some

important information which Wakefield fliers will be interested to hear. The new requirements for Wakefield models is that the wing should have from 120 to 210 square inches of area. The minimum weight that the model may be is eight ounces.

This is something to know. Model builders now will have to build ships that fly because of their efficiency rather than because of freak air conditions. Instead of a contest which features hunting for air currents, it is now one of model design.

AIR WAYS CLUB

All model builders should join the Air Ways Club. There are no dues. Simply send your name and address to Air Ways Club, MODEL AIRPLANE NEWS, 551 Fifth Avenue, New York City, and a membership card will be sent you.

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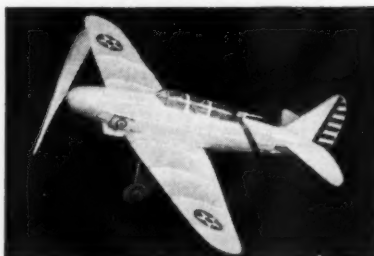
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| F 40 Vultee V-11 | F 43 Boeing F4 B4 |
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PROPELLER, RED
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The 1937 Precision 820

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Precision Built of the Finest Materials

An improved design constructed to give lasting performance and utmost dependability. The alloy steel cylinder has fins machined integrally. The head and crankcase are also fitted for second cooling. All crankcases are finished in green enamel unless otherwise specified. The ignition system is fully enclosed, is adjustable and locks into position. The coil is the finest obtainable, sealed in an oil and moisture proof case. Counterbalanced crankshaft and lightweight rod make the 820 an exceptionally smooth running engine. Both for appearance and performance you will be proud to power your finest model with the Precision 820.

SPECIFICATIONS:

Bore 13/16" H.P. — 1/4 at 5000 R.P.M.
Stroke 3/4" Weight 11 oz.
AERO PRECISION MACHINE WORKS
2250 E. Colorado St. Pasadena, California

"Gas Lines"

(Continued from page 19)

sorbers, while the bearers can be replaced in a very short time.

"The weight of the ship is 4 pounds, 13 ounces. It is covered with 1/32" balsa and bamboo paper which is doped with titanine."

Wigdor tells us that the top speed is eighteen miles per hour and the stalling speed is thirteen miles per hour. It climbs 100 feet from the take off in nine seconds. It also is equipped with an automatic ignition cut off. Wigdor has found this advantageous, as have many gas model builders in this country. The device, he says, is most useful for testing a five second flight and allows the model to take off and run easily. This machine has a very fine climb and due to the Grant KG section is very unstallable.

Mr. Wigdor makes a very interesting remark concerning the design of his ship.

He says that the tail plane has a negative incidence of forty-five minutes and the engine a down thrust of two degrees. We wonder just how he has figured these values. The forty-five minutes' negative angle in the tail plane is forty-five minutes to WHAT? If he means forty-five minutes from thrust line, it is accurate. On the other hand he infers, by mentioning the two degree down thrust, that he does not figure the tail angle relative to the thrust line, which must be done.

In speaking of the two degrees down thrust we would like to know from what base line this two degrees is figured inasmuch as all angular values of the wing, tail or any other part of the ship is figured from the thrust line. We do not understand how an engine can have two degrees' negative thrust. Obviously a thrust line cannot be negative to itself.

Unless all values are figured in this manner a designer can have no intelligent method of comparison between ships or performances with the same ship. We would appreciate a word from Mr. Wigdor concerning the actual angular relationship of the wing and tail relative to the thrust line of the ship.

The gas model bug has invaded South America, for we have word from Luiz Pedro Gomes of Rio de Janeiro, Brazil, P.O. Box 1727. He says:

"I am a subscriber to your magazine and take pleasure in sending you a picture of my fifteen-year-old son, who has built the first Baby Cyclone gas model in Rio de Janeiro."

Mr. Gomes refers to picture No. 5, which shows his son, Milton, holding his gas model. He tells us that on one flight it flew in a 100 foot circle for 4 1/2 minutes. One does not have to think very deeply in order to realize how the knowledge of the various phases of aeronautics is increasing throughout the world through the medium of gas model designing, building and flying. This is one of the best ways of testing your ideas, your knowledge and of learning something new concerning aviation. It appears that young men have recognized this to a fuller extent than their elders.

Henry Clark of 46 Fourth Washington Avenue, New York City, sends us a shot of a very unfortunate incident. However such things will happen to the best-built gas jobs. We refer to picture No. 6 which shows the remains of Paul Zakim's Cavalier at the contest held at Hadley Field, New Jersey, last fall. Mr. Clark writes us that as a result of this episode, Zakim attempted to sell off the wreckage but at the last moment weakened because of the great urge that brings about gas models. He decided to keep the remains and "sew it up" all over again. Clark also tells us that Zakim is headed for other ambitions; that of being a transport pilot. He intends to enroll at one of the popular flying schools, all due to the little bug which gas models seem to hatch in all of us.

Picture No. 7 shows a neat-looking low-wing ship built by Bud Schiffman of 1504 East 33rd Street, Brooklyn, New York. He says:

"Although it does not have many fly-

ing qualities it looks like a streamlined bullet. The motor is completely cowed except for the spark plug. It has a trap-door leading to the gas tank and another under the fuselage for the insertion of batteries. The wing span is $4\frac{1}{2}$ feet and it weighs complete $1\frac{1}{4}$ pounds."

We appreciate gas model builders who tell us of some of their misfortunes as well as their good flights. Such a procedure helps other builders to know what not to do. We venture to say that the crash of Bud's ship was due mainly to the fact that it has a very small wing span for the power and because the ship was of a low-wing design. Low-wing gas models may be built but they require very careful design in order to have them show stable qualities. In other words they are very tricky and critical.

Mr. Francis R. Stevens of 700 Oglethorpe Street NW, Washington, D.C., has just joined the I.G.M.A.A. and formed a unit. It is called the Friendship Gas Modelers Club and is under the direction and management of Brent Danials. Mr. Danials is a radio technician of the Department of Commerce. Stevens sends us picture No. 8, which shows a corner of his workshop and a plane in the process of construction.

A very interesting ship has been built by Walter Bobkiewicz of 128 Lexington Avenue, New York City, which is shown in picture No. 9. It is a Fokker Triplane gas model. We regret that its builder does not give us any information concerning its performance. It is always of interest to know how planes fly when they are of a design other than the monoplane type.

Down in Wewoka, Oklahoma, an I.G.M.A.A. member, Earl Harrison of 1207 Okfuskee Avenue, writes us telling of the five foot job which he has completed and flown. It weighs only $2\frac{3}{4}$ pounds. The little ship was designed by David Robertson of Muskogee, Oklahoma. Harrison built the ship and they entered it in the Oklahoma City State Fair Contest, where it placed eighth. This is an excellent performance for so small a job. Usually contest planes have greater wing span. Picture No. 10 shows Harrison with his gas model.

Another very interesting motor has made its debut and it is shown in picture No. 11. It is the Ohlsson Miniature. This motor is unique inasmuch as it is mounted radially; that is, it bolts to the front face of a vertical plate instead of resting on horizontal stringers. It is sup-

ported at three points. Its removable crankcase facilitates cleaning and repairing the motor.

We hear from H. Endean of 1, Fifth Street, Lower Houghton, Johannesburg, South Africa. The gas model bug has reached this country and there is quite a bit of activity there and Endean has completed and tested a KG. Picture No. 12 shows it in full flight. He says that as balsa wood is hard to obtain the ship has been built up of plywood and hardwood stringers. He has done an excellent job for the weight is only $5\frac{3}{4}$ pounds. He says:

"The plane had three flights before a minor crack-up occurred. The longest flight was of twelve minutes' duration. During the building of it, I was always afraid of the altitude of Johannesburg, which is a little over 6000 feet. (It does not seem to have affected its performance.)

"On her flight of twelve minutes the engine ran for four minutes only. The glide altitude astonished me, considering the altitude."

John Genco of 1239 Waterman Avenue, Fresno, Calif., sends us picture No. 13, which shows him with his Cyclone-powered Monocoupe model. Genco tells us that this was the first gas model he built. However since that time he has made three more. When it was constructed it was the first gas model built in Fresno. The ship was designed by Genco and weighs three pounds, four ounces, ready to fly.

Picture No. 14 will give you an idea of what young men of Russia are doing with gas models. It shows a young Soviet builder, Shura Khlystov, a schoolboy of Khrakov, Soviet Ukraine, at work. Details of the construction of the model may be ascertained from examination of the picture. Khlystov intends to enter the model in a contest which will take place in Moscow early in 1937.

Alfred Jolliffe writes us from 1217 East 20th Avenue, Vancouver, B.C., Canada. He tells us that he is a member of the Vancouver Gas Model Club and sends us picture No. 15 which shows some of its members and their planes, at the first Canadian Gas Model Contest held last summer. The winners were:

John Cameron won with a flight of 6 minutes, 29 seconds, made by his California Chief. Fred Hollingsworth with a model of his own design was second with 6 minutes, 14 seconds. J. Knowland was third with 5 minutes, 54 seconds. Alf Jolliffe was fourth with 3 minutes,

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5 seconds and D. Gidley was sixth with 2 minutes, 17 seconds. They all had Corbin planes.

Jolliffe warns gas model builders against carelessness in wiring their models. He says:

"Rex Richards of California was unfortunate enough to have his plane catch fire due to a short circuit."

Gas model builders should take care to see that their wiring is neat and perfect and that the construction is such that no oil or gasoline can seep through the engine down into the fuselage and remain there. This has caused several ships to catch fire.

H. A. Thomas of 3425 West 7th Street, Little Rock, Arkansas, a member of an active group of gas model builders of this city, writes us concerning the maximum weight allowed for gas models at contests. We are wondering if other model builders feel the same as he does. He tells us that most of the models that they are building weigh over seven pounds and that they fly very well. He has for-

warded several pictures which arrived too late for publication, but we can assure you they indicate that the models are beautifully designed and constructed.

Thomas and his group of builders would like to have the maximum weight rule changed and he wishes to know how many other fellows think it would be a good thing to raise the maximum weight limit.

This point is open to discussion among I.G.M.A.A. members.

Everett Conway provides a good example of showing how interested one can become in gas model building. He tells us that he is in show business and lives in hotels, auto camps and apartments, moving from one to another in quick succession as his show moves from one town to another. He says:

"Because of this it was necessary to build a model that could be 'knocked down' to a smaller size than any kit job I could find advertised, so I started by buying a Bunch Mighty Midget which I received and assembled in Helena, Mon-

I flew it six times altogether and it suffered three minor crack-ups before I finally got it adjusted. However the last two flights were very satisfactory. The ship was very stable and glided nicely. The model has a sixty inch wing span and is thirty-nine inches long. The wing was composed of two twenty-four inch sections, which slotted into a twelve inch center section by means of the tuborod principle."

Mr. Conway's experience illustrates well what can be done under adverse conditions when determination is present.

Model builders of Boston, Massachusetts, have formed the Boston Gas Model Society which is now publishing a weekly sheet entitled "Gaskets," under the editorship of Albert Lewis.

Mr. Leo Rutledge of 243 South Rutan, Wichita, Kansas, sends us a cold weather suggestion for those who have built gas models and do not wish to wait until the spring to test them. He says:

"Run the motor indoors then put the plane in your car with the engine close to the car heater. When you get to the flying field run the motor again, put on the wings and it is ready to go places."

NOTICES

Many new members of the I.G.M.A.A. may not know that there has been established a permanent duration trophy which is now held by Maxwell Bassett of Philadelphia, Pa. He won this with a flight of twenty-three minutes, eighteen seconds. If any contests are held by units under the International Gas Model Airplane Association sanction and rules, the officials should take the greatest of care to notify headquarters, 551 Fifth Avenue, New York City, of any official flight which exceeds this mark. The trophy will then go to any I.G.M.A.A. member who makes a greater duration at any official I.G.M.A.A. contest.

It is requested that all secretaries of units, when they write their regular monthly club report to the "Gas Lines" editor, be sure that they give the correct unit number and name of their club in their letters. This should be included in all correspondence so that news may be put under the proper heading.

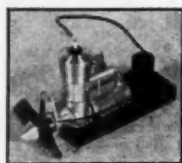
Any unit or group of units who wish to hold contests should get a copy of the official I.G.M.A.A. rules from headquarters. Before contests can be held, sanction must have been granted from the Association's directors. This can also be obtained by letter from headquarters. After the contest a complete report must be filed showing the procedure followed at the contest, and official times. This must be sent by the contest director who will be held responsible for any inaccuracies.

IMPORTANT: ALL MEMBERS AND UNITS

New membership cards will not be issued for 1937. The 1936 membership cards will signify bearers as members of the Association during 1937.

Will all unit leaders please send to I.G.M.A.A. headquarters immediately the names of the officers of their club, its official name, and most important—the

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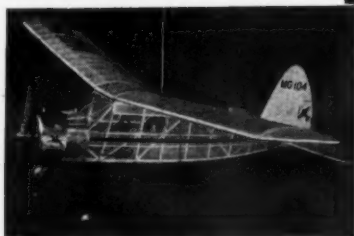
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tana. In Spokane, Washington, I built an aluminum motor mount and a balsa cradle for my coil and batteries, etc. At Wall Walla, Washington, I had my rock-mable propeller and temporary soldering completed so I block tested the motor, which performed in a manner that was very gratifying. I then sent for my air wheels. In Boise, Idaho, I drew up the design and built my fuselage. In Twin Falls, Idaho, I built the landing gear and stabilizer and mounted the motor and ignition. In Pocatello, Idaho, I built the rudder and assembled, covered, doped and lacquered the whole job. To complete the picture, let me add that the wing sections were in the process of construction during the entire procedure.

"Now for the important part. When we arrived at Grand Junction, Colorado, I was alarmed to discover the altitude was 4600 feet, but as the weather was very fine I decided to test hop the model.

name of the club sponsors or leaders. All units must have a unit leader who will be responsible to the International Gas Model Airplane Association for the regular monthly report of activities of the club and for its participation in any I.G.M.A.A. contest. Such a leader should be chosen by the unit. When this has been done and he has been sanctioned by the director of the I.G.M.A.A., he will be listed officially as a unit leader.

At the present time we do not have a complete list of the above information and we desire to bring our files up to date.

Lost Models

This month we have a record of two models that have been lost. If anyone finds them or knows of the whereabouts of these models, will they please notify the respective owners. The unfortunate young men are:

Peter Bowers, Palo Alto, California, Box 357. The motor number is Baby Cyclone X-1176.

Albert B. Solomon, 5212½ Drexel Avenue, Chicago, Illinois. This motor is a Brown Junior No. B-1779.

Pins

Members should not overlook the fact that membership pins may be had for twenty-five cents each. If you wish one, write immediately to headquarters and enclose your money.

Change in Units

Heretofore a total of eight members has been required in order to form a unit. This rule has been changed. Hereafter a unit may be formed with a membership of only five members.

UNIT NEWS

Among the new units that have been formed is unit No. 30, the Fort Worth Model Aero Club of 3432 Avenue K, Fort Worth, Texas. Bob McMahan is president; Mr. Peterson, vice president; Claude Green, secretary. The members are: Bob McMahan, Ward Essner, Joe Walls, Fiske Hanley, Gordon Bourland, Willie Gunn, Claud Green, Billy Erickson, Jack Beckelman, Carrol Brown, Mr.

Peterson, Billy Roundtree.

This club is planning to have a contest in the spring.

Unit No. 31, the Friendship Aero Club, has been formed at 4911 44th Street N.W., Washington, D.C. Mr. Brent Danials is acting president and Francis R. Stevens is club secretary. Following is a list of members:

Francis R. Stevens, Andy Oliveri, Jack Perine, Hubert Hartly, William Miller, Robert Little, Walker Moore, Raymond Donohue, Carrol Carter, Edward Barker, Brent Danials.

In Milwaukee, Wisconsin, is the Hell Divers Gas Model Association of 1331 South 15th Place. This is unit No. 27 of which Edward J. Brounk is secretary and treasurer. The members are:

Harold G. Sinskey, Paul Grossman, Berton Schmidt, Phil Coeper, Walter Shoen, Edward J. Brounk, Charles A. Vogel.

All members have to produce a gas model or part of one in three months time from the date of entering the club or they are asked to resign. This insures a registry of active members.

Another unit, No. 29, has been formed at 406 South Arno Street, Albuquerque, New Mexico. It is the Albuquerque Gas Model Association and Bill Denison is president; Lee Erlandson is secretary-treasurer. This club is now endeavoring to get "Chalky Breece," a well known local pilot, as their sponsor. The members are:

Bill Denison, Lee Erlandson, Phillip Whitener, Bob Seth, Louis Chaves, Jim Thompson, Richard Westlake, George Brown.

Elbert J. Weathers, corresponding secretary of unit No. 18, which is the San Diego Gas Model Club of 2720 Poinsettia Drive, San Diego, California, has been instrumental in increasing the membership of this club. They now have 50 members; the recent additions numbering about thirty.

John Czajkowski, secretary of unit No. 8, which is the South River High School Model Airplane Club of 12 Arlington Avenue, South River, New Jersey, announces that the annual club election of officers was held recently. The new officers are: Joseph Boricheski, president; Kenneth Van Duersen, vice president; John Czajkowski, secretary and treasurer. Mr. Harry E. Froude is faculty adviser.

Unit No. 33 has been formed in St. Paul, Minnesota, under the name of the Twin City Gas Model Club, 2292 Stewart Avenue. Gordon Schindler is president; Bob Raymer is vice president and Robert Toft and Francis Chaffee are treasurer and secretary respectively. This unit is composed of twenty-two members.

Mr. J. S. Blackton, Jr., of the Denny Industries, has just sent us applications for membership of twenty-three boys in unit No. 34, which is located at 5751 Hollywood Boulevard, Hollywood, California. Among these are two very prominent young motion picture stars, Jackie Cooper and Freddie Bartholomew. We extend a most cordial welcome to them and will look forward to hearing about their gas model activities with great interest.

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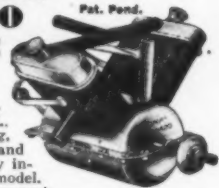
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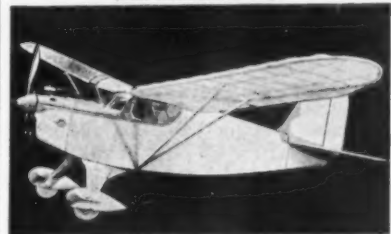
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7 in. each 12c			15c
8 in. each 15c			20c
9 in. each 18c			25c
10 in. each 20c			30c
11 in. each 25c			35c
12 in. each 30c			40c
13 in. each 40c			50c
14 in. each 50c			60c
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16 in. each 70c			85c
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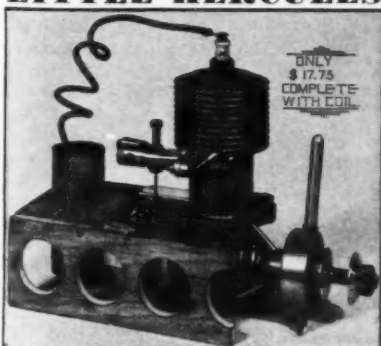
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3/16x2	3 for 5c	1/16x1/4	14 for 5c		
1/4x2	1 for 7c	3/32x3/32	12 for 5c		
1/2x2	1 for 7c	1/8x1/4	7 for 5c		
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1/4x3/4x5	5 for 5c				
1/4x3/4x5	5 for 5c	1x1, 1 for			
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1 1/2x1/4, 6 for	5c	Sheet Celluloid	1 1/2	10c	
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Thinner Best			Needs		
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SKYWAY MODEL AIRCRAFT SUPPLY CO.

This group has proved to be one of the most active on the west coast and is outstanding for its sportsmanship. There are many units in California and members who wish to belong to any should get in touch with them at the addresses given.

Aviation Advisory Board (Continued from page 30)

from turning. This in turn tends to react through the propeller on the engine and turn the engine and plane, in which it is mounted, in the opposite direction from which the propeller rotates.

The more resistance the propeller blades create to their passage through the air, the more torque reaction there will be and the more the plane will bank. In gas models this is very typical. The chief cause for excessive torque in gas models is too little propeller area, or too high a pitch for the propeller area used. The best way to decrease this torque is to increase the area. If by doing this the engine is slowed down to too great an extent, then the pitch may be reduced.

Torque usually results from the propeller blades contacting the air at too great an angle as the plane moves forward. More area will reduce this angle of attack.

Question: What is the advantage or disadvantage of the multi-propeller, as used in tandem fashion on the present world speed record holder, the Italian Macchi-Castoldi? Are one or two engines required for their successful operation?

Answer: The advantage of such an arrangement of propeller is that the torque of one balances the torque of the other and there is no tendency for the plane to turn to one side. The control of such a plane is smoother and more easily accomplished. This is due to the fact that two propellers turn in opposite directions.

The disadvantage of such an arrangement is chiefly a mechanical one. Special gearing must be used between the propeller and the engine. Only one engine is required although two may be used if desired. The front propeller revolves on a central shaft while the rear propeller

revolves on a shaft around the central shaft. In other words, the shaft of the front propeller passes through the shaft of the rear propeller.

Russell Tree of 7322 7 Avenue, Kenosha, Wisconsin, wants to know:

Question: How may the center of gravity be determined in a biplane model while designing it?

Answer: The center of gravity of a model may be calculated in the same manner as the center of gravity of a large ship. How to do this is shown in detail in the November 1933 issue of MODEL AIRPLANE NEWS in the article, "Aerodynamic Design of the Model Plane."

Question: What is center of resistance and how may it be determined?

Answer: The center of resistance is that point at which, if the total resistance of the airplane was concentrated, the total concentrated resistance would have the same effect that the sum of all the resistances concurred by a plane in flight would have.

How it may be done involves too long a discussion here. We suggest that Mr. Tree go to the library and read some of the books on aerodynamics, which will go into detail.

Question: How may the center of projected lateral area be determined?

Answer: The center of projected lateral area may be determined by taking the moments of each individual lateral area or section of area of the plane and calculating its moment about a definite point chosen above the wing. The moment arm of each area should be the vertical distance from the center of that area to a horizontal line drawn through the point about which the moments are to be calculated.

The projection of each area times the moment should be all added together and then the sum should be divided by the total amount of area in the lateral projection. This will give the distance from the zero point mentioned previously to the center of lateral area. This distance should be measured vertically.

The same procedure should be taken horizontally at a point about the nose of the plane. The distance of the area from

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5"	26c	
6"	29c	
7"	32c	
8"	35c	
9"	38c	
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GAS model letters and numbers, permanent, samples and price list, 10c. Arrow Model Company, 18 Austin Street, New Britain, Conn.

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the point in this case should be measured horizontally from the area to a vertical line passing through a zero point at the nose.

Question: What is the difference, if any, between an airplane mechanic and an airplane engine mechanic and what is their pay?

Answer: The name of the particular mechanic mentioned indicates his occupation. An airplane mechanic is a mechanic who takes care of the mechanics of the airplane itself, not necessarily including the engine. However, an airplane mechanic is usually referred to as one who understands engine mechanics as well as the mechanics of the airplane structure.

An airplane engine mechanic is one who keeps in repair the airplane engine alone. Such a man is a specialist in engines and not in airplane structure.

It is not possible to state accurately the pay of men in this occupation inasmuch as it depends greatly upon the company for whom they are working and the job upon which they are working. However, the pay is affected to a large extent by the ability of the men. The pay for such men is often standardized.

It is not wise to figure too much on how much one is going to get and not on how well one will do the job. The pay will come as a natural result of the latter.

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Fellows! We have it now! You want to build a gas-powered model that will perform with the best of them . . . a beauty to look at, and yet easy to build. You don't need to work for weeks, experimenting, you just follow our large clear, full-size plans . . . and use any model airplane engine you prefer. It challenges the world with a new low price . . . and *airwheels* are included!

Easy to carry in an automobile, wings easily removed and landing gear folds back. Wheels well forward of propellers for safe landings and to protect propeller. Fail-proof landing gear absorbs hard shocks. Rudder adjustable, stabilizer semi-adjustable, motor easily removed.



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3 1/4" Airwheels. Fail-proof landing gear. Two full-size plans 28"x34". Cutout propeller blank. Extra hard Balsa wood. Special steel wire, sheet aluminum for cowl, bamboo paper, cement, etc. Chord, 9 1/4". Wing-span, 5 ft. 7". Length 47".

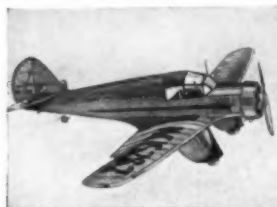


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One of a long line of model kits of beautiful, romantic and historic ships, accurate, colorful, appealing. The "Bounty" kit contains all necessary material to build a complete and authentic model of this ship so famed in story and motion pictures.

1/8" scale model **\$1.00**, postage extra, **15c**.
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AERONCA A new 1/2-inch scale flying model—wonderful to build. Aluminum drag ring, shaped wheels, complete supply of material and liquids. 50c. Postage, 15c extra.



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CAUDRON RACER The winning Thompson Trophy race flown by the famous French flier Detroyat. Complete 25c plus 10c postage.

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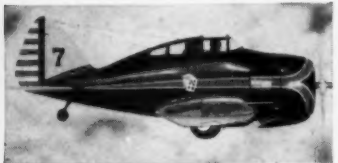
AN EYE WITNESS I

Describes His Impressions of the Famous C-D Master Modelbuilders Experimental Workshop and Designing Department

I've just been through the workshop where the famous C-D models are completely thought out and worked out. These people certainly know model airplane creation from A to Z—and, frankly, I don't see how they can turn out such marvelously realistic models for such low prices. Their designs are as carefully worked out as are designs for big planes—so thoughtfully planned that even beginners become expert builders in no time. On this page I'm describing the latest models Cleveland has developed—and from the big reception they are getting, each one seems to be just what thousands of modelbuilders have been waiting for. Only a company with the long experience Cleveland has—almost 20 years—could produce such masterpieces of model engineering. They're way out in front—nothing even close to them. You'll get more thrills and education out of building and flying one of these than a dozen ordinary models—I really mean it!



FAIRY is anything but a fitting name for this new English battle plane—but that's what it's called—and as far as I'm concerned, it can keep its name, but I'll always be leery of it hereafter, for this baby is anything but that. Even in the severest tests, it did such astonishing things that designers of the entire world perked up their brows, and started to take notice. Its complete name is FAIRY "BATTLE," and 1000 of 'em are being built for England's Fighting and Bombing Fleet. Hope I never meet one of these babies in the air. Cleveland has turned out a 20-inch "REP" all-silver model (pictured above) that is creating almost as much astonishment among model designers as the big plane has. It zips through the air with the greatest of grace—and is a long distance flier. Be sure to get it. Kit R-67, complete (except no liquids) postfree, only \$1.10.



SECRET lists in Washington kept information on this new U.S. Army fighter "under wraps" unusually long. It's a regular razzle-dazzle in appearance and performance—if you follow me—reputed to pack something more than 300 m.p.h. under its cowl, which isn't exactly standing still. Once you start building the C-D model of this SEVERSKY FIGHTER (shown above) you'll get the feel of a high powered performer from the very start. Span 24". Blue fuselage, yellow wings and tail; red stripe trimming, white outline. Landing gear extendable, or retractable, for display. Kit SF-61 complete (except no liquids) postfree, only \$2.65.

• Also available in 1/4" Dwarf model. Span 16". Kit D-61, complete (except no liquids) postfree, only \$1.10.



FAMOUS name in American air records is the one of Stinson. This snappy C-D model is an eye-taking reproduction of the new STINSON RELIANT cabin plane. Belongs to C-D's 20-inch "REP" Group—flies prettily and lands like a charm. Suggested coloring is snappy green, with cream trimming. Kit R-66, complete (except no liquids) postfree, only \$1.10.

Latest Cleveland Designs

Be Up-To-The-Minute With C-D And Build These At Once

BEECHCRAFT C17B

Now this beautiful all white Beechcraft, deftly trimmed in red is available for those model builders who have repeatedly asked us to manufacture this design for them. The Prototype is flown by many private owners throughout the United States and is well liked. Has exceptional flying visibility. This very unusual model is for any enthusiast to add to his dwarf fleet. Span 15 1/2". (No 3/4" model available.) Absolutely complete but without cement or dope, only **\$1.10**



BRISTOL FIGHTER ★ Light Plane Pontoon



After repeated requests for over five years that we design a model of this famous war time fighter it is now ready for C-D fans. Span 19 1/2". Beautifully colored cream wings and tail, green fuselage, silver nose and most effectively trimmed with red and white. Complete kit (except no liquids included) postfree only **95c**



A Pontoon kit including necessary struts and suggestions for attaching to other types of S F models besides the Aeronca for which it was purposely designed. Also fits Ryan ST KIT R-58 and other Repls. Suggestions in kit for attaching to other models. Materials for two Pontoons supplied. Complete dry kit (without liquids) **35c** only

Note! In accordance with our new policy all C-D's now come without liquids.



TWINS might be a good nickname for this new monarch of the sky—one of the great Silver Fleet—for it has twin rudders as well as twin motors. It's the impressive new LOCKHEED ELECTRA, and Cleveland has outdone itself in the beautiful 27 1/2" Dwarf model of it. Kit contains absolutely everything to build this great flyer, except liquids. You get all the necessary strip wood (and it's top quality throughout), all the necessary curved parts printed on flat sheets ready to cut out. All necessary wheels, covering tissue, blocks for pilot, etc., etc.—and last, but most important of all, a full size C-D drawing and instructions (worth \$1.00 if sold separately.) This twin-ruddered, twin-motored beauty has rubber motors protruding through the wings behind the nacelles, and is a beautiful sight in flight. Suggested coloring: all silver. Kit D-65, complete (except liquids) postfree, only \$2.75

SECOND edition of our now famous Hobby-Catalog—First edition sold within two months. Nothing like it ever published before. This issue is literally bursting at the seams with pictures and descriptions of hundreds of flying models, every kind of material and parts imaginable, solid models, railroad kits and supplies, ships, gas engines, gas models and steam engines. Also thousands of hard-to-get items difficult to find elsewhere. No model-builder can afford being without this book. It's a reference book of almost everything you and all model builders need and you'll find it saves you money and time. Be sure to send for your copy before supply is exhausted. Enclose 10c to cover packing and mailing. Delivery early February. Large Supplement and R. R. announcement later, 5c extra. Don't wait—send today.

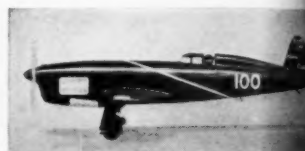
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GIANT of the airways of America—offered in Dwarf size. Not so small, either for the C-D model of this DOUGLAS TRANSPORT (that's pride of the pilots airlines alike) measures 42 1/2". An armful, to be sure, but a performer that never fails to attract real compliments to its owner. This is unquestionably one of the best known planes throughout the world today—and has so rounded itself with dazzling performance in the every day job of keeping the mail and passengers moving, that it has become an instantaneous favorite among modelbuilders. You'll like the fast powerful pull of the twin motors on this realistic C-D model, but no more than the long hours of each sport you'll find in building it. The Kit itself is a regular treasure chest of parts and supplies—everything, except of course no liquids (C-D's no longer contain liquids, you know). Suggested coloring: all-silver. Kit D-55 postfree, only \$3.75



MILLION Frenchmen may be wrong, but million dollars—never! Especially when it's used by the French Government to build a CAUDRON RACER, compete in the 1936 Thompson Trophy Races at Los Angeles. And so France grabbed off the honors, and this is the baby that did it. Looks as though it could go places, too, doesn't it? And C-D's perfect 3/4" model of it can, too. A dandy stepper—outer that will stop your idea cold with pure amazement and admiration. Even if you're not building a Thompson line up—don't be without this sweethearts. It's tops in any line-up. All blue with a sparkling pin stripe, of red, white and blue markings. Retractable landing gear. Span 16", length 17 1/2". Kit SF-63, complete (except no liquids), postfree only \$1.95

• Also available in 1/4" Dwarf model. Span 11 1/2", length 11 1/2". Kit D-63, complete (except no liquids) postfree, only \$1.45



CONTEST conducted by Be Brothers of Detroit, which this and other specially designed C-D Kits were offered resulted in such overwhelming demand for this beautiful miniature of the popular WACO C-6 CABIN that C-D has included in the Cleveland line. Instructions for two types of coloring are given with each Kit. Makes a striking appearance in the air, and its flights are a joy to any modelbuilder. Span 17 1/2". Kit D-64, complete (except no liquids) postfree only \$1.10

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